FIREARM SILENCERS

NOLAN WILSON

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Desert Publications
El Dorado, AR 71730

Firearm Silencers

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Historical Background

Thanks to Hollywood, there are very few people who aren't at least passingly familiar with silencers and their use. Unfortunately, the silver screen has shown them more misinformation than actual fact.

First and foremost, there is no such thing as a "silencer", to be technically specific. Correct terminology is "sound moderator" or "sound suppressor". However, from this point on we will bow to popular usage and refer to said devices as silencers.

Silencers work well in Hollywood, no matter what their size or the weapon on which they're used, simply because the script says they work. A secret agent or undercover cop can attach a tiny 2" long silencer to the muzzle of a .44 Magnum revolver and go out and blow the bad guys away with nothing more than a "phut, phut". That's the way it is in the movies, but in real life it just doesn't work that way, especially on a revolver. The reason for this will be explained in the chapter on how silencers work.

The idea of silencing, or effectively reducing, the sound of a firearm's report actually dates as far back as the 17th Century, if not earlier. Some European troops of that time were armed with silenced air rifles, which were much more powerful than the air rifles we know today. These silenced air guns were especially popular for sniper use. A couple of attempts were even made to produce air machine guns during the early 1800's, but these are more notable for their novelty than for their success. Several attempts were also made to reduce the sound of the report of actual firearms, including an interesting one patented by J. A. DeBrame in 1861. DeBrame's invention supposedly produced the same velocity and muzzle energy as a standard revolver of a given caliber, but with a reduced powder charge.

Numerous other attempts met with varying degrees of success, but the invention of a truly effective silencer had to await the development of smokeless powder, since black powder residue would have fouled the silencer's interior very quickly.

There is an interesting legend that Hiram P. Maxim got the idea for the first successul silencer by watching water draining from a bathtub. He noticed that the water formed a whirlpool as it drained and likened the water to the powder gases that escape from the muzzle of a gun. Whether the legend is true or not, it is known that Maxim's first attempts to build a silencer were based on the principle of swirling the powder gases to reduce the noise of the report. Maxim soon discovered that it wasn't actually necessary to swirl the gases, but just slow them down.

Maxim was issued a patent for his first silencer in 1908. A perfectionist, he soon improved upon it and brought out his Model 1909, which was followed the next year by the Model 1910. The latter became especially popular.

Although he was the son of Sir Hiram S. Maxim, the famed machine gun inventor, Hiram P. didn't set out to design a silencer because of his interest in guns. His initial concern was in noise

reduction, no matter what the cause. Even in the pre-World War I era he foresaw noise pollution eventually becoming a serious health hazard. The Maxim Silencer Company began manufacturing outboard motor silencers and industrial silencers in the early 1920's, and ceased producing firearm silencers in 1925.

Early advertisements for Maxim silencers gave no hint of the nefarious or covert use to which silencers would later be put. The emphasis was on reduced noise for plinking in an indoor basement range or in the back yard without disturbing the neighbors. Maxim catalogs invariably contained photographs of well dressed men and women spending a pleasant afternoon shooting at the local range or engaged in informal trap shooting with smoothbore rimfire rifles on the front lawn.

Covers of early Maxim catalogs always emphasized silencers' recreational use, whether for hunting or for informal plinking.

Maxim also emphasized the practical application of silencers to hunting arms as both a noise and recoil reducer. In one of his catalogs he related the story of how he and some friends went shooting with their Springfield M1903 rifles which were equipped with Maxim silencers. Maxim's 9 year old son went along and was allowed to fire his father's rifle. Ordinarily, it would be downright sadistic to allow a child of that age to fire a rifle with the recoil of a .30-06, but young Hamilton Maxim surprised everyone by asking if he could fire it again, then again, etc. The silencer reduced the weapon's recoil to the point where the child hardly noticed it, and he was able to place his second shot in the bullseye.

Although Maxim silencers hardly took the world by storm, they still enjoyed a commercial success which prompted other inventors to try to develop and market silencers which wouldn't violate Maxim's patent. Robert A. Moore of Chicago was granted his first silencer patent in 1910. Moore's silencer featured a gas tube under the barrel. Upon firing, the bullet would push the baffles that were placed in front of the muzzle out of the way and pass beyond, then the baffles would drop back into place and force the expanding gases down into the chambers of the gas tube. Moore's first model never got past the prototype stage, but it was an interesting concept nevertheless. Moore's second design actually went into small scale production and he was able to sell 100 to the U.S. Army for field testing. Lack of further orders was not so much an indictment of Moore's product as a change in Army policy — they simply decided that silencers were't practical in battle since they wanted the enemy to know he was being shot at. Their reasoning was that if a man knows he is under fire, he will be a much less effective adversary.

The Maxim silencer did, however, go to war in Mexico where a number of federal troops were armed with silenced rifles. Mexican officers reported that those soldiers so armed were generally more effective in battle than those armed with normal, unsilenced rifles. Part of the reason, they said, was because of the reduced report and recoil of the silenced weapons. They simply caused less stress physically and mentally than standard issue arms. It was also reported that units armed with silenced rifles could hear officers' commands while

firing. Those armed with conventional weapons could not.

When Gen. John J. Pershing led American troops into Mexico in 1915 in search of Pancho Villa, he took along 15 snipers armed with silenced Springfields. So far as is known, this was the first time in history that the military had used silencers for sniping. However, it certainly wasn't the last. The Germans nicknamed silenced Allied sniper rifles "Whispering Death" during World War I. Before the end of the war, German snipers were also using silenced rifles.

Although numerous inventors patented silencers and tried to manufacture and market them, Maxim had only two serious competitors in the United States. One was the old New England arms firm of Hopkins and Allen and the other was the prestigious British manufacturer, Parker-Hale. They were the Big Three of silencers back in the days when you could walk into the local hardware store and buy right off the shelf, or have them order for you, a full auto Thompson and a silencer for it, no questions asked. Of course, if you lived in New York or Chicago and wanted a single shot .22 pistol, you had to first get a permit for it. Gun controls were already beginning.

Following World War I, America enjoyed a period of unprecedented prosperity. The Roaring Twenties were at hand, and they were especially prosperous for bootleggers and speak-easy owners who made a fortune off illicit booze. With the easy money to be made, it wasn't any wonder that every gang that was big enough to have a territory also wanted the territory next door. The most famous gang rivals were the Capone and Moran mobs of Chicago. The ultimate gangland slaying, the St. Valentine's Day Massacre, was engineered by Al Capone to eliminate Bugs Moran. The "hit" in a South Side garage successfully eliminated seven members of Moran's gang, but the leader himself showed a complete lack of courtesy by being late for his execution. Hearing shots as he approached the garage on foot, Moran simply turned around and walked in the opposite direction. Such execution type slayings helped to give the Thompson submachine gun a tarnished reputation, but equally bad times for silencers would come in the 1930's.

With the repeal of prohibition in 1933, the huge profits from alcohol smuggling, bootlegging, moonshining, etc., vanished. The mobs had to turn to other ways of making money. Although gambling, prostitution and loan sharking were where the easy money was, many Mafia hoods also turned to legitimate amd quasi-legitimate businesses as well.

PRICE LIST

.22 Cal. Silencer and Coupling.

Coupling drives tight on end of barrel. Silencer attaches or detaches by single twist of the wrist.
Dimensions and price including Coupling, Model 1912, 1 in. x 4⅛ in., wt. 5 oz., $5.00.
When ordering, state MAKE and MODEL of rifle to be fitted, and whether barrel is ROUND or OCTAGON, so we can supply proper size coupling.

.25-20 Silencer and Coupling.

Coupling drives tight on end of barrel. Silencer attaches or detaches by single twist of the wrist.
Dimensions and Price including Coupling, Model 1912, 1 in. x 5¼ in., wt. 7 oz., $7.00.

.32-20 Silencer and Coupling.

Coupling drives tight on end of barrel. Silencer attaches or detaches by single twist of the wrist.
Dimensions and Price including Coupling, Model 1909, 1⅝ in. x 6¼ in., wt. 12 oz., $7.00.

.22 H. P. Silencer and Clamp Type Coupling for Savage H. P. .22 cal. rifle.

Coupling locks on barrel by means of locking clamp. Silencer attaches or detaches by single twist of wrist.
Dimensions and Price including Coupling, Model 1912, 1 in. x 5¼ in., wt. 7 oz., $8.50.
Price, Silencer only $6.00. Price, Coupling only $2.50.
All calibres larger than above take same price, $9.50 with coupling and $7.00 without coupling

High Power Silencer and Clamp Type Coupling. Any Calibre.

For rifles having front sight MOUNTED UPON BASE built onto barrel. Silencer attaches and detaches by single twist of the wrist. Full length magazine must be shortened to make room for coupling.
Dimensions and Price including Coupling, Model 1909, 1⅝ in. x 6¼ in., wt. 12 oz., $9.50.
Price, Silencer only $7.00. Price, Coupling only $2.50.

High Power Silencer and Sight Type Coupling. Any Calibre.

For rifles having front sight DOVETAILED INTO BARREL. Coupling drives tight on end of gun barrel after removing front sight from rifle. Silencer attaches and detaches by single twist of the wrist. Full length magazine must be shortened to make room for coupling.
Dimensions and Price including Coupling, Model 1909, 1⅝ in. x 6¼ in., wt. 12 oz., $9.50.
Price, Silencer only $7.00. Price, Coupling only $2.50.

Page from an early Maxim catalog shows the wide range of Model 1910 silencers offered. This model is easily recognizable since the bullet's path is offset from the actual centerline of the silencer. This was done purposely to allow the use of the weapon's original sights. If you think the prices shown are super cheap, just remember that $100 per month was considered a good wage in those days.

The face of crime changed with the Depression of the 1930's. "Name" criminals of the 1920's had been men like Al Capone and Bugs Moran, all men with large, well financed and well run organizations. But with hard times, better roads, faster cars and still fairly poor communications among police forces, the "name" criminals of the 1930's were

the bank robbers. To many out of work Americans who had lost their homes or farms to the bank, the idea of someone being able to strike back at the bank and hit it where it hurt — in the vault — had a certain perverse appeal. The public almost made folk heroes out of the more famous gang leaders such as John Dillinger.

The Thompson already had a bad image from the 1920's, and that image wasn't enhanced any when some of the gangs began using automatic weapons. One of John Dillinger's cohorts was Baby Face Nelson, who was a born tinkerer. Not only did Baby Face convert a Colt .45 auto to full auto, but he also made up some silencers for the gang's use. As more and more exotic weaponry (which was perfectly legal to own at the time) turned up in the hands of the gangsters, there was a growing trend to outlaw such weapons. Further outrage was expressed that hungry people were actually using silencers for poaching!

Congress attacked the crime problem in the same manner in which it had attacked the drinking problem years before. Even though Prohibition had been proven unworkable and had been repealed, Congress attempted to fight crime by prohibiting the manufacture, transfer or possession of certain devices. The National Firearms Act of 1934 placed a $200 tax, plus a lot of bureaucratic red tape, upon the manufacture or transfer of automatic weapons, silencers, sawed off rifles and shotguns and other assorted goodies. People who already owned said devices were given a certain period of grace in which to register them *without* paying the tax. After that time, it was a possible long prison sentence and heavy fine for having them in your possession.

As could be expected, honest people registered their silencers, machine guns, sawed off shotguns and other "forbidden" weapons, but the hoods didn't. The machine gun toting bank robbers did vanish from the scene, but not because of the NFA of 1934. They were simply killed in shootouts with police or went to prison. In fact, the last of the machine gun bandits to go out in a hail of lead, Ma Barker, was killed in January 1935, just months after the passage of the NFA.

With silencers no longer available at the local hardware store and the transfer tax equal to more than a month's pay for most people, it's understandable that the legitimate market for them died almost overnight.

After the United States entered World War II in 1941, there was suddenly a resurgence in the demand for silencers to be used by the "good guys". The military needed them for sniping and other normal combat tasks as well as for covert operations by the O.S.S., the military intelligence organization which was the forerunner of the present, non-military C.I.A. A number of interesting silenced weapons were developed for the O.S.S. and these will be discussed in the next chapter. As far as normal combat operations by troops actually in the field, the Springfield M1903A3 equipped with a silencer served well as a sniper rifle. Other silenced weapons included the Thompson M1A1 and the M3 "Greasegun". The silencer for the latter was assembled by High Standard on perforated barrels made by the Guide Lamp Division Of General Motors. Although this silencer was designed by Bell Laboratories, it bore a remarkable similarity to the integral silencer on the High Standard HD.

In some instances, silenced weapons were carried not to be used, but as a precaution if a weapon *had* to be used. In October 1942, a group of men dressed in ragged civilian clothes emerged from a submarine just off the coast of occupied France and proceeded to land in a rubber dinghy. The group was armed with three silenced Sten submachine guns and each man carried a silenced pistol as well. They were on what could very well have become a suicide mission if they had run into a German patrol, for they were destined to meet with free French leaders to discuss the impending invasion of North Africa. Leader of the group was none other than Major General Mark Clark. Since the party made it back out of France, one can only assume that the silenced weapons weren't needed or else were used with a great deal of success. The latter possibility is more glamorous, but the former is probably the actual fact.

Early in the war, Maxim Silencer Company president Hamilton Maxim was visited by representatives of the O.S.S. who wanted the company to resume production of firearm silencers, which they had abandoned in 1925. The Maxim staff designed and made a sample rifle silencer that met the specifications the O.S.S. men had outlined. It was demonstrated favorably to top military brass in Washington, but Maxim never received a production contract and all of the silencers legally made for the war effort in the United States were manufactured by other firms.

As is to be expected in wartime, a rather large number of silenced weapons simply disappeared. Some were undoubtedly destroyed or honestly lost in battle, but others were obviously stolen and secreted away for later use by future terrorists, revolutionaries and other assorted characters of

doubtful reputation. A few may very well have been misappropriated by average GI's who just wanted a really unusual souvenir from the war.

When World War II ended, it didn't necessarily bring peace to the world. Fighting continued in a Southeast Asian country then known as French Indochina. Soldiers of fortune fighting in the French Foreign Legion liked two American World War II "left-overs" that were fairly common in the area — the M3A1 "Greasegun" and the High Standard HD. When the Communists finally defeated the French in 1954, French Indochina was divided into three nations. The name of the largest of these remained virtually unknown to most Americans until a decade later when it became a household word — Vietnam.

The average person at home heard little or nothing about the use of silenced weapons in the Vietnam War, but they were used quite extensively since they were ideally suited for the type of jungle warfare that occurred in Vietnam. Viet Cong advance scouts could be taken out of action without alerting the main party, or a sniper could pick off a small group without being detected by shooting the rearmost man first, then moving his shots on up the line to the front.

The ubiquitous Ruger 10/22 was a popular silenced "hit" weapon in Vietnam as it was extremely quiet when subsonic ammunition was used in it. Standard M14 and M16 rifles were also equipped with silencers for special missions, as well as Remington Model 700 sniper rifles. The standard issue sidearm for Navy SEAL team members was a modified Smith & Wesson Model 39 fitted with a silencer. Among the most successful silencer designs employed in Vietnam were the Scionics units designed by Gen. Mitchell WerBell.

As the Vietnam War wound down, American GI's began returning home to face readjustment to civilian life. Some of them had become so used to the tension of a combat zone that they literally craved the stress under which they had been living. Assembling cars in Detroit or selling life insurance in Scranton simply had no appeal for them. A number of Vietnam era pilots decided to return to the air — flying illegal drugs into the U.S. At least one ex-Marine sniper is known to have become a hit man for the Mafia, currently the prime user of silencers in the U.S.

The days of machine gun slayings in garages or messy hits with a sawed off shotgun in a crowded restaurant or drugstore have gone the way of the Edsel and black and white TV. Today, mob leaders are conscious of the need to keep as clean a public image as possible. Gangland executions are usually carried out with a silenced .22 pistol. Those who would argue that the .22 lacks the stopping power of a .357 Magnum or .45 ACP have obviously never seen anyone who has taken a half dozen .22 Long Rifle slugs in the back of the head. A quiet, clean hit and no one knows anything has even happened until the body is found under a stairwell, in an alley or under a bridge that spans a dry wash. Sometimes the body is never found. To the mob, silence is truly golden. It usually means a clean getaway and a police report that reads ". . . suspect foul play, assailant unknown."

Needless to say, numerous illegal silencer factories have sprung up in various parts of the country in recent years. It's the old law of supply and demand at work. There is a strong demand for silencers, so for the right price someone will supply. The BATF shuts these factories down as quickly as they can locate them, but in the meantime their wares flow into the black market with a really effective homemade silencer bringing as much as $900. At this writing, an equally effective silencer purchased legally in a European country that allows them would probably sell for $15-20. Surprisingly, some European countries which have rather stringent requirements for handgun ownership just don't make that big a fuss over someone wanting a silencer. Apparently the official theory is that if you have already qualified for handgun ownership, there is certainly no reason why you shouldn't own a silencer too. One can well understand such thinking, since most of these countries are densely populated, thus are extremely noise conscious. It would undoubtedly please Hiram P. Maxim to know that somewhere in the world the government bureaucrats actually understand what silencers were all about in the first place — reducing noise pollution.

Clandestine Silencers

Although silencers are widely used by professional assassins as detailed in the preceding chapter, they are probably used to an even greater extent by covert agents — in other words, spies and counterspies.

It's doubtful if there has yet been a James Bond movie where there wasn't at least one assassination, or attempt at one, with a silenced handgun. This is a very real fact of life in the shadowy world of covert operations, although normally the East and the West don't go around killing off each other's superspies. The fact of the matter is that to do so would invite retaliation in kind, and really good superspies just aren't pounding the pavement looking for work, unless that happens to be part of their cover. From a purely practical point of view, espionage agents of the upper echelon take a lot of time and money to train. No, it's usually the smaller fry who are eliminated, either as a warning that the other side is getting too close to something or someone or simply to prevent the spy from learning something or from passing on what he has already learned.

A case in point is the bombing of the American embassy in Beirut in the spring of 1983. One of the CIA's top agents was killed, along with numerous other people. While the bombing might have been engineered by the KGB, it's more than likely that it was done by a group of terrorists. One such group has already claimed credit for the foul deed, but they may just be seeking publicity with their claim. If the KGB or the Red Chinese had wanted to eliminate the American agent, they would most likely have used a more subtle approach, such as poison

Although silenced pistols might well have been used by intelligence operatives during World War I, they really came into their own in World War II. Their clandestine use wasn't limited to spies, but also included resistant groups in occupied Europe and guerrillas in Asia and the Pacific.

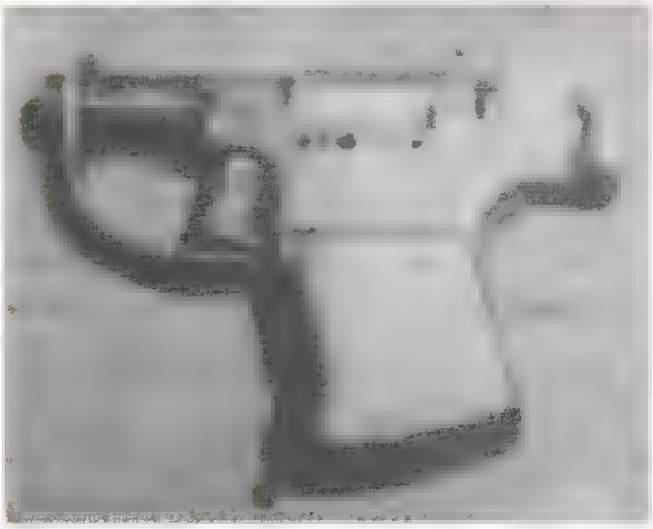
Silenced weapons for covert operations were of two types: standard production arms which were fitted with silencers or adapted to include an integral silencer, and special weapons specifically designed for covert use.

Pre-existing weapons which were altered to include an integral silencer were the Colt Woodsman, High Standard HD Military, M1A1 Thompson, M3A1 "Greasegun" and M1 Carbine. Please note that the use of the term "integral" here doesn't mean that the silencers couldn't be removed. It simply means that the weapons were meant to be carried and fired with the silencer in place, as opposed to just attaching a silencer to a normal weapon for a special assignment.

Among those weapons that were specifically designed for clandestine use during World War II we find the Liberator, the Welrod and the fist gun. They seem like oddities today, but each was designed for a specific task which it executed (no pun intended) rather well. Since these guns are less known to most people and are far more interesting than those which were merely adapted to take an integral silencer, we will devote our attention to them first.

The idea for the Liberator first came about in 1942 when the Polish Resistance requested arms with which to fight the Germans that occupied their homeland. The American Joint Chiefs Of Staff decided that a low cost, concealable, untraceable weapon would be an ideal choice to supply to civilians behind enemy lines.

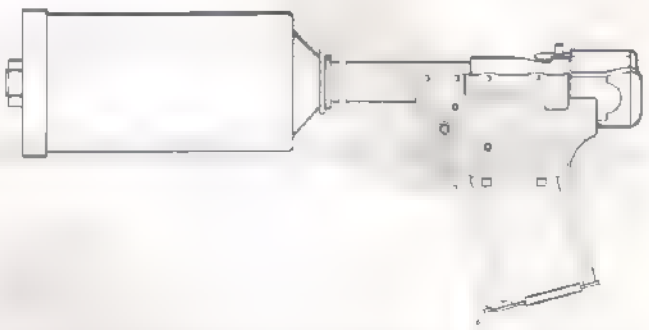
The weapon would act as a morale booster for the citizens of occupied countries and would also serve to sabotage the morale of the enemy. Any student of history knows that one of the first things a dictator does when his troops occupy another country is to disarm the conquered people. Hitler was no exception. If the Americans could get guns into the hands of resistance groups, it would give them a chance to kill German soldiers and take their weapons as well. It would take only a few such incidents to make any German soldier leery of every civilian he encountered in an occupied country.



F.P. 45 Liberator

Since its role ideally was to fire only one shot, the Liberator was spot-welded and riveted together and no attention was given to overall finish. The goal was to produce a large number of the weapons as quickly and cheaply as possible. The Chief of Military Intelligence requested that 1,000,000 of the guns be made for distribution behind enemy lines in May 1942, and the guns were completed by the fall of that year. The project was so secret that only the people who did the final assembly had any idea what they were working on. Blueprints were purposely mislabeled so the person who made the trigger guard thought he was making a spanner, the one who made the sear thought he was making a yoke lever, etc. Since the barrel was a smoothbore, there was no telltale rifling which would have immediately told the "tube" maker what it actually was.

The Liberator, which was officially known as the F.P. 45 until after the war, was packaged in a cardboard box with 10 rounds of .45 ACP ammo, a wooden ramrod for ejecting spent cartridge cases and a sheet of comic strip instructions with virtually no written instructions. That solved the potential language barrier or illiteracy problems before they could occur.



Artist's conception for a Liberator with an improvised silencer, in this case using an aerosol spray can for the housing. Obviously, numerous other possibilities for improvised silencers exist.

The Liberator cost $1.72 per unit to produce, and the entire package, ready to drop behind enemy lines, cost $2.10.

While the basic design was a single shot with ammo storage in the grip, a two shot version of the Liberator was also made. This had a sliding breech that was slid from side to side to align either chamber with the barrel. Silenced versions of the Liberator are also known to exist, and some have been encountered which have been fitted with homemade silencers.

Only a few Liberators were smuggled into occupied Europe, but a good many were sent to Asia and the Phillipines, where they were known as the "kangaroo gun" since they were smuggled into the islands by Australian submarines. For some time after World War II the Liberator served as the standard sidearm of the Phillipine Constabulary. Today Liberators are a prized collector's item, especially if accompanied by the original box and ammunition, instruction sheet, etc.

In addition to the silenced versions already mentioned, the standard Liberator was capable of being used as a silent weapon with a James Bond device known as a "Bigot". This was a silent

dart which could be fired from any .45 ACP pistol which had been fitted with a special adapter. Unfortunately, the Bigot wasn't ready for production until after the end of the war, so never realized its true potential. Its very existence remained classified until 1977.

First model Welrod was in .32 ACP. Note that this was a true bolt action.

Unlike the Liberator, the Welrod was designed as a silenced pistol from the start. It was a manually operated repeater and examples have been seen in .22 Long Rifle, .32 ACP, 9mm Parabellum and .45 ACP calibers. The .32 and .45 versions were manufactured so as to accept standard Colt magazines. Although most Welrods had a slip-on grip that covered the magazines, a few exist where the magazine itself serves as the grip.

The action is of the basic Mauser bolt type. In fact, the first model Welrod actually utilized a bolt to open and the close the action. But by the time the Mark I went into production, a simpler knurled knob had been substituted for it.

The integral silencer contained the usual baffles plus a self-closing rubber baffle. Holes were drilled in the barrel to bleed off gas.

With a properly constructed silencer, a pistol of the Welrod's type action in subsonic .32 ACP or .45 ACP would be about as ideal as a close range assassination weapon could be since the report of the weapon would be effectively muffled and the bullet's crack is non-existent. An assassin armed with such a gun would have more to worry about being seen than being heard, especially in a noisy place such as a train station, etc. Whatever sound the pistol might make would easily be disguised by the hubbub of background noise. With the action being opened and closed manually, the assassin wouldn't even have to worry about leaving any telltale brass!

How many Welrods were made and the various theaters of war in which they were employed isn't known, but one could probably safely assume that they were used far more often in Europe than in the China-Burma-India Theater or in the Pacific. We had mentioned earlier that the East and the

Late model 9mm Welrod with the magazine only serving as the grip. The trigger guard is also non-standard.;

West don't go around killing each other's superspies. That's in peacetime, of course. The rules are a bit different in wartime. You have only two choices if you catch one of the enemy's master spies: recruit him into being a double (or even triple) agent, or cancel his birth certificate. One can't help but wonder how many threats to Allied security were eliminated by Welrods, whether on neutral ground, in enemy territory, or on the home front.

The fist gun, as it's called on its patent issued July 8, 1947, could also be called a glove pistol since it's just that — a rather strange looking pistol attached to the back of a glove.

Although well suited to an assassin's use, the fist gun was originally designed to be worn by non-

Office of Naval Intelligence's fist gun was originally intended for 410 shotgun shell, but production models were made only in .38 S&W caliber.

combatants who happened to be close enough to the front to be in danger of having their position overrun. Supply truck drivers, communications personnel, etc., would fall into this category.

To fire the fist gun, the wearer merely doubled up his fist, folding his fingers out of the way and exposing the muzzle and plunger, then pressed the device against the victim's body. The plunger would move to the rear, dropping the hammer against the firing pin. If the gun was pressed against the soft areas of the stomach, sides or low back, the flesh would fold over the muzzle and effectively silence the sound of the shot.

Originally designed for a .410 shotshell, the fist gun was actually produced in .38 S&W caliber, which would seem to be a rather poor choice. However, the manufacturer may have selected that caliber over the more effective .38 Special due to a difference in chamber pressures, etc.

The fist gun was in production for only a short time after the war. It was never destined to be a huge success due to its very limited range of applications. Still, it probably deserved a little more positive attention than it actually got.

O.S.S. High Standard HD Military with silencer removed to show bronze screen around barrel.

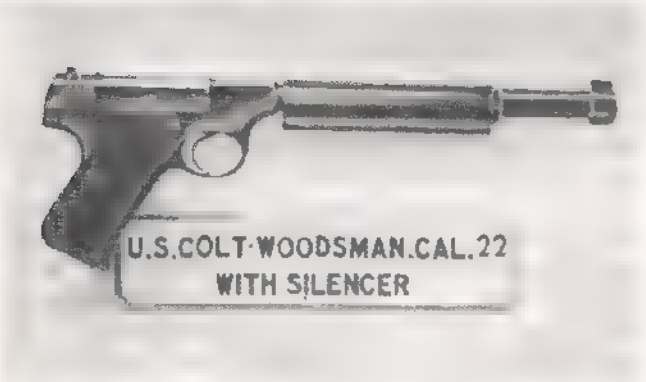
The High Standard HD Military pistol in .22 Long Rifle was reportedly made in two silenced versions. The first was made for the O.S.S. during World War II and had four rows of eight holes each drilled in the barrel with copper screen washers for baffles. This pistol was extremely quiet. Just how effective the silencer was can be readily seen from an incident that happened early in the war. Gen. William "Wild Bill" Donovan, head of the O.S.S., took a sample pistol to the White House to demonstrate to President Franklin Delano Roosevelt. FDR was dictating to his secretary when Donovan entered the room, so the general set a sandbag in one corner of the room and, with his back to the president, calmly emptied the pistol's magazine into the sandbag. Neither the president nor the secretary noticed the sound of the shots and Gen. Donovan turned and handed the pistol to the Commander In Chief, explaining what he had just done. Roosevelt was so pleased with the new weapon that he immediately had it placed on public display at the Roosevelt Museum in Hyde Park. It was only a few days before someone at the museum realized there was a serious breach of security by displaying the weapon, which was actually top secret, and removed it from its display case.

Gas bleed holes in HD's barrel are clearly shown in this photo. Note that the barrel is much thinner than a standard .22 pistol barrel.

The second model HD, which has been manufactured in unspecified numbers for the C.I.A., has a special barrel of minimum acceptable wall thickness with four rows of eleven holes each. The barrel is then wrapped in bronze screen. A hollow housing is screwed on over the barrel. The front of the housing, forward of the barrel, is filled with washers constructed of stamped bronze screen. Since the perforations in the barrel bleed off expanding gases, standard high velocity .22 cartridges can be used in the weapon. Famed U2 pilot Frances Gary Powers had a silenced HD in his possession when his plane was shot down over the Soviet Union. Powers evidently realized the futility of trying to escape from the Soviets and chose to let himself be captured rather than commit suicide with his issue HD or cyanide pills. He probably also realized that he would be valuable "trading material" for

the Soviets, who imprisoned him for a short time, then exchanged him for one of their own spies who was in custody in the U.S. Powers died several years after his return to the U.S. when the TV news helicopter he was piloting crashed.

The O.S.S. also used a number of Colt Woodsman pistols in .22 Long Rifle during the war. The specimen illustrated is rather unusual in that it has an eccentric silencer, which allows for a larger capacity expansion chamber while retaining the original sight plane. It also had a barrel extension beyond the silencer, which is extremely unusual.



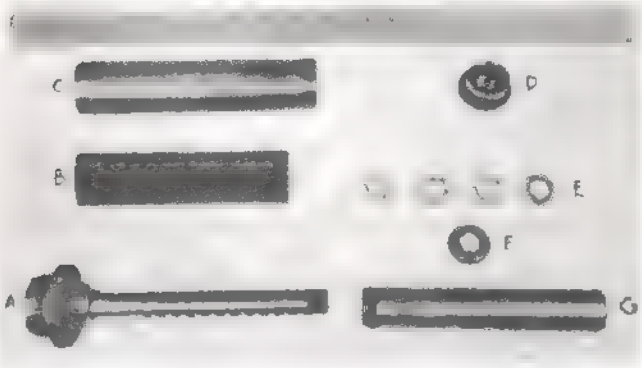
O.S.S. Colt Woodsman sporting a rather unusual silencer. Its eccentricity isn't unusual (note the Model 1910 Maxim directly above it), but the barrel extension beyond the silencer is. (Photo courtesy of Gun Digest)

A small number of M1A1 Thompsons were also fitted with silencers for special purposes, but these were overshadowed by the more prevalent M3A1 silenced "Greasegun" SMG's which were much cheaper to produce yet were just as effective in

M3A1 "Greasegun" fitted with a 12" silencer. A 20" silencer is shown below. While the O.S.S. used silenced M3's, they were rejected by the Infantry Board which could find no real need for them.

combat. As mentioned earlier, the M3A1 silencers were manufactured by High Standard and fit over specially perforated barrels made by the Guide Lamp Division Of General Motors.

What would appear to be a barrel extension on the M3A1 silencer is actually a second silencer



Parts of the "Greasegun" silencer below 2 ft. scale to show relative size. The parts are:

- **A. Perforated barrel made by Guide Lamp Division of General Motors.**
- **B. Wire mesh cylinder which slips over the perforated barrel.**
- **C. Large metal tube which fits over the mesh cylinder.**
- **D. Bushing adapter which screws onto the end of the barrel and into which the small tube is screwed.**
- **E. Wire mesh washers which are contained in the small tube (230 are used).**
- **F. End cap which holds the washers in the small tube.**
- **G. Small tube itself.**

tube which contained over 200 screen washers. The larger tube, which fit over the barrel, contained a roll of bronze or aluminum screen. This silencer was, like the weapon it served, cheap to produce yet effective. It's estimated that the sound of the report was reduced by as much as 80% with this silencer. Since the .45 ACP cartridge is subsonic, there was no bullet crack to worry about.

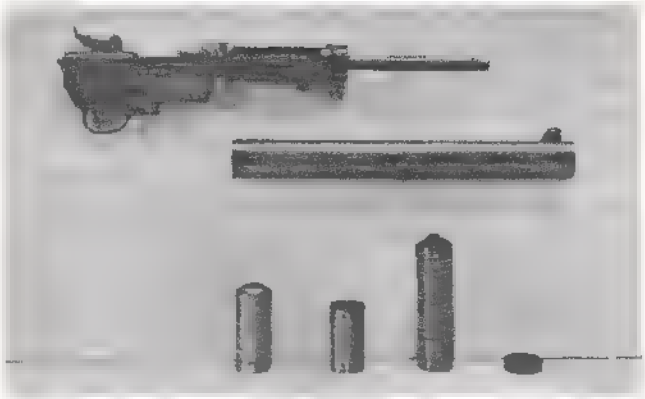
Component parts for the "Greasegun" silencer are shown in the photo at the bottom of page 11. Functioning was similar to that of the High Standard HD.

At least one example of a professionally modified M1 Carbine is known to date from the World War II era. Its barrel has been shortened and the silencer housing extends roughly 10" beyond the muzzle. Although the .30 Carbine cartridge is supersonic, there are no bleed holes in the barrel.

The silencer itself consists of two chambers, with a perforated bushing around the end of the barrel which allows gas to flow from the front chamber into the rear, which contains 10 baffles. An unspecified number of baffles are also housed in the front chamber. It's reported that the action has to be worked manually since the carbine's gas system is rendered inoperative by the short barrel. Whether this is true or not, a manually operated action is desirable on a silenced weapon, which is obviously intended for specialized use rather than for engaging in firefights.

Following the war, silencer development in the U.S. stagnated somewhat. This is understandable, since silenced weapons don't wear out overnight

Professionally modified M1 Carbine with integral silencer is believed to have been made for the O.S.S., although little is known about it. The weapon itself was made by the Inland Division of General Motors, which made untold thousands of M1's and M2's during the war. (Photo courtesy of Gun Digest)



M1 Carbine with silencer removed and disassembled for display purposes. Note lack of gas bleed holes in the barrel even though the .30 Carbine cartridge is supersonic. (Photo courtesy of Gun Digest)

and there was an ample supply of wartime hardware on hand to fill our government's needs. When viewed in a purely logical, businesslike manner, there simply wasn't enough demand for improved silencers to make their development profitable.

The picture began to change in the 1960's, however. America was again at war in Asia, this time in Vietnam. Ordnance genius Gen. Mitchell WerBell began to explore the possibilities for improvements in silencer design with notable success. Manufactured under the trade name Sionics, a number of his silencers saw action in Vietnam. The weapons on which they were used were discussed in the preceding chapter and need no further elaboration here.

Although silencers are generally thought of as tools for snipers, spies and assassins, there is a growing market for them among the general population. Inflation has placed the $200 transfer tax within the realm of affordability for many honest people who have a legitimate use for silencers. These include farmers and ranchers who want to keep the critter population under control without disturbing the livestock and urban dwellers who would like to be able to keep their shooting skills well honed with a little smallbore practice in the basement. There are presently several small firms manufacturing silencers aimed at this market. One of the better known is Automatic Weapons Company. Their silencer for the Ruger ST pistol is based on the original model built by the now defunct Military Armament Corporation, but with one major difference. The MAC silencer was designed for clandestine use and couldn't be taken apart for cleaning and repacking, since it was considered expendable after 200 or so rounds. This is acceptable for

a government agency that is spending the taxpayers' money for a replacement and which doesn't have to pay the transfer tax, but is a burden on the ordinary citizen who is spending his own money and only wants to pay the tax once. The AWC silencer can be taken apart for periodic servicing and the repacking materials consist of such common items as Chore Girl cleaning pads, aluminum screen, fiberglass, etc., which can be purchased at the local supermarket and building supply store.

Easily serviceable silencers like the AWC designs would be a boon to the clandestine operator as well, since he seldom has a friendly neighborhood armorer living next door and must repair and maintain his weapons himself, should they need it. Sophisticated surveillance devices now make it possible to spy on the world from a satelllite. But like the infantryman with a rifle in the age of nuclear missiles, the spy with the silenced pistol will still be around for a long, long time.

How Silencers Work

As was stated in the first chapter, there is really no such thing as an actual silencer. What people call "silencers" are actually sound moderators or suppressors. They merely alter or reduce the sound of a weapon's report, they don't eliminate it altogether.

What is sound? Reduced to its simplest explanation, sound is merely air in motion. This causes changes in air pressure which the ear registers as sound, transmitting it to the brain. If there is no one to hear it, there is no sound. A roaring avalanche would be completely silent, even though there would be a tremendous amount of air in motion.

Sound also diminishes with distance. The report of a .38 Special with a 2" barrel can cause the shooter's ears to ring if he or she isn't wearing ear protection. To a person a block away, the sound will be fairly loud but far from painful. A mile away, it might not be heard at all.

There are actually seven different elements that make up what we usually think of as the report of a gun, although one or two might not be present under certain conditions or might be so insignificant as to hardly be noticeable.

The first is the precursor wave, which is caused by the bullet traveling down the barrel and suddenly compressing the air in the bore. This compressed air precedes the bullet out of the barrel.

The second sound is the bullet exiting the barrel. Both of these sounds go unnoticed in unsuppressed weapons as they are completely overshadowed by the third sound, which is the escape of the burning powder gases from the barrel. This is also known as muzzle blast, and makes up the majority of the sound we hear when an unsuppressed weapon is fired.

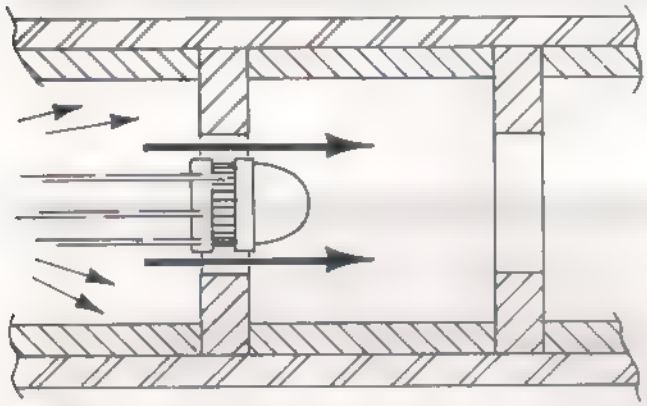
The fourth source of sound is blow-by, which can only occur in suppressed weapons. Since the holes in the baffles which the bullet travels through must of necessity be larger in diameter than the bullet itself, a certain amount of gas escapes through the open area and actually precedes the bullet out of the silencer to join the precursor wave.

The fifth source, which is also present only in suppressed weapons, is jet noise. This is caused by turbulence, swirling gases and reverberation within the silencer itself.

The sixth component, which is present no matter what type of firearm, is the mechanical noise of the action. In a properly suppressed semi-automatic or automatic weapon, this sound is usually the major one heard, yet it can be almost nonexistent in a bolt or lever action. In autoloading weapons, this sound is accompanied by residual pressures in the chamber escaping when the action opens.

The final sound is bullet crack, which is nothing more than a miniature version of the sonic boom you hear when a jet aircraft breaks the sound barrier. The bullet crack is, quite literally, the sound of the bullet as it passes the sound barrier, which is roughly 1100 feet per second (fps). This sound is the easiest to eliminate, and isn't present at all in subsonic calibers such as .32 ACP, .380 ACP, .38 Special, .44 Special, .45 ACP, etc. It is present

in virtually all rifle calibers, including .22 Long Rifle, and in some handgun cartridges such as the 9mm Parabellum, .30 Luger, .357 Magnum, etc. However, the 9mm is still an excellent cartridge for use in suppressed weapons since it can be "loaded down" to subsonic velocities or it can be slowed down by bleeding off some of the propellant gases through vent holes in the barrel (see photos of High Standard HD on page 10 and M3 "Grease-gun" silencer on page 11).



Blow-by occurs when part of the expanding powder gases (small arrows) actually pass the bullet and precede it (large arrows) as it passes through the holes in the baffles of a silencer. These holes must necessarily be a good deal larger in diameter than the bullet in case the silencer is mounted askew or slightly off center on the weapon.

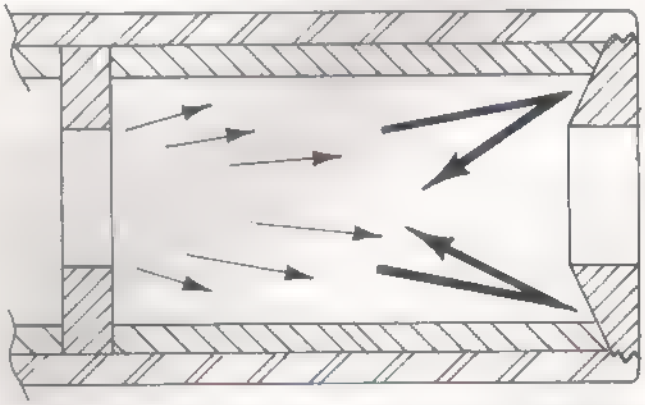
Since the muzzle blast is the major factor in producing noise, reducing it is the simplest and most effective way of attempting to silence a weapon. To reduce the muzzle blast, silencers are designed to accomplish two things: slow the exit of the gases from the barrel and cool them down at the same time.

Ideally, a silencer will have three separate chambers, although some highly effective designs don't have that many. The first chamber is the entrance chamber. It may be completely empty or it may contain heat or sound absorbing materials. The middle chamber contains baffles which serve both to absorb heat and slow the gas expansion down by allowing it to expand in small, individual compartments. The final chamber is the exit chamber, which is closed by an end cap. This end cap should be shaped in such a way that the blowby gases are blocked and driven backward by it. They will then collide with the main body of expanding gas and create turbulence, thus slowing the escape of the gases from the hole in the end cap.

While it's theoretically possible to silence virtually any weapon that is designed to be held in the hand and/or fired from the shoulder, it isn't always practical. A silencer *could* be built that would silence a .308 Norma Magnum firing factory ammo. But you would probably need a wheelbarrow to haul it around.

A silencer which would work well on a revolver would have to enclose almost the entire weapon. When a revolver is fired, burning gases escape from the gap between the front of the cylinder and the barrel, and with them comes a significant part of the gun's report. A current state-of-the-art silencer can be fitted onto the end of a revolver's barrel, but its effectiveness will be greatly impaired by that cylinder gap.

Despite this fact, there have been instances in which silencers have been used on revolvers for serious purposes. One example is the "tunnel rats" of Vietnam. These were U.S. servicemen of small physical stature who were called in to search Viet Cong tunnels whenever a new one was discovered. The tunnels were usually abandoned, but not always. There was no way to know until someone went in and physically checked them out. The tunnel rats often carried only a handgun for a weapon, with the silenced High Standard HD Military being a favorite. A few men, however, preferred .38 Special revolvers with silencers. This was practical for their use since they weren't actually trying



The end cap of the silencer (far right) should be shaped in such a manner that when the blow-by gases (large arrows) hit it, they will bounce back and hit the main body of expanding gas (small arrows), causing it to slow down. The gas is also cooling as it slows down. Even though the whole thing happens in a matter of miliseconds, the longer it takes for the gas to escape from the silencer and the cooler it is, the quieter the sound of the report.

to silence the weapon, but merely reduce the report to a decibel level which would be bearable within the close confines of the tunnel.

Although they can be more effectively silenced than revolvers, automatic and semi-automatic weapons are still less than ideal for that purpose. Action noise and the escaping residual pressure were covered earlier, so the reasons should be apparent. A MAC 10 fitted with a silencer is a lot quieter in operation than one without, but it still has a sound level that is definitely noticeable. The main noise is the action. To a person standing a few yards away, it sounds about like a carpenter hammering. The Red Chinese overcame this problem with their PRC Type 64 pistol, which can be operated manually *or* as a semi-auto.

As mentioned in the preceding chapter, the actions of the Welrod and the silenced M1 Carbine had to be worked manually. This is a highly desirable feature for a silenced firearm since it eliminates action noise altogether when the weapon is fired. Of course, such weapons were designed to be used under circumstances where the shooter would have a high probability rate of achieving a one shot kill, since sustained fire with them is difficult at the very least.

Bolt action rifles have traditionally been used by snipers because their inherent accuracy is superior to other types of actions. However, the fact that the bolt can be manipulated slowly and quietly certainly doesn't hurt, especially if the weapon is fitted with a silencer. The use of silenced sniper rifles in Vietnam was covered in the first chapter, but it should also be pointed out that they were used by both sides in both World Wars. When they feared capture, German snipers of World War II would generally bury their rifles or throw them down a well, as the Allies treated captured snipers the same as spies and summarily shot them.

While most commercially made silencers have metal tubes and either plastic or metal screen baffles, there are a number of other materials which can and have been used to make silencers. One experimental model from Automatic Weapons Company had a PVC tube and used baffles made from corrugated cardboard. It was test fired with over 100 rounds of .22 Long Rifle ammo before it was sectioned for study. It turned out to be more effective and durable than its makers had hoped.

Although nothing is really cut and dried in silencer design, beyond the limits of practicality, there are a few rules of thumb which will help to assure success if followed. Generally speaking, the internal free volume of the silencer tube should be about 20 times the internal volume of the bore, with about 40% of that space taken up by the entrance chamber. Obviously, you would need a much larger tube for a .30-06 with a 20" barrel than for a .22 pocket pistol with a 3½" barrel. The length of the tube should also be roughly 5 times its diameter. These ratios can be varied somewhat if necessary, but are considered close to ideal by the people who should know — the successful commercial silencer manufacturers.

Revolvers are difficult to silence due to the gap between the front of the cylinder and the barrel. Note the large amount of burning gas in the cylinder gap of this Smith & Wesson .38 Special revolver fired after dusk. This particular gun's gap isn't overly large, but is actually typical of most revolvers.

Although firearm silencers as such are strictly controlled by the government, there are other alternatives for noise reduction which are perfectly legal. Soundproofing an indoor range is one. For outdoor use, a handful of old tires lined up side by side to form a "tunnel" can also be used. Simply stick the muzzle of the gun a foot or so into the tunnel. A cardboard box with cardboard baffles lined up in it can also be used, although it will eventually become a fire hazard due to the collection of unburned powder that will eventually build up in it. So far, the BATF hasn't construed any of these methods to be actual silencers, probably because they would be a bit awkward to carry around when going out to make a hit or otherwise try to silence the gun's report for questionable reasons.

However, there have been a number of homemade silencers worked up which are highly illegal since they are attachable to the gun and are easily transportable. It's anybody's guess how many people have taken lawnmower mufflers and tried to turn them into silencers. One source even reports

that an empty liquid detergent bottle filled with cotton makes a pretty effective one shot silencer. Another story says that the nipple from a baby bottle will work if you cut an X in the end, then slip it over the gun's muzzle. Whether these work or not, they are still illegal since they show *intent* to silence a weapon. In fact, a person could face a prison sentence even if the silencer's design was so bad that it actually increased the sound of the report by several decibels. If you doubt it, just try convincing a jury that said contraption was actually a muzzle brake or flash suppressor!

If you feel that you simply must attempt to build a truly effective silencer, go about it the legal way. Apply to the BATF for approval to build one for your own use. The $200 check that goes with the application may put a dent in the family budget, but it's still a lot cheaper than not drawing a weekly paycheck for several years because you're doing time in Leavenworth!

Silencer Patents

Although Hiram Maxim's silencers were state-of-the-art in the pre-World War I era, other inventors continued to try to come up with new designs, either in an attempt to improve silencer performance or in order to circumvent the Maxim patent. While some of these designs appear to be sound in principle, none of them achieved the commercial success of the Maxim silencers. Actually, even they hardly made an impact on the shooting world that could be likened to, say, the impact of the Model T on personal transportation. As we pointed out earlier, the Maxim Silencer Company had phased out firearm silencer production by 1925 and was concentrating on marine engine and industrial silencers. It's doubtful if Hiram P. Maxim anticipated the passage of the National Firearms Act of 1934 by doing so. He probably was simply practical enough to realize that other types of silencers offered a more lucrative market.

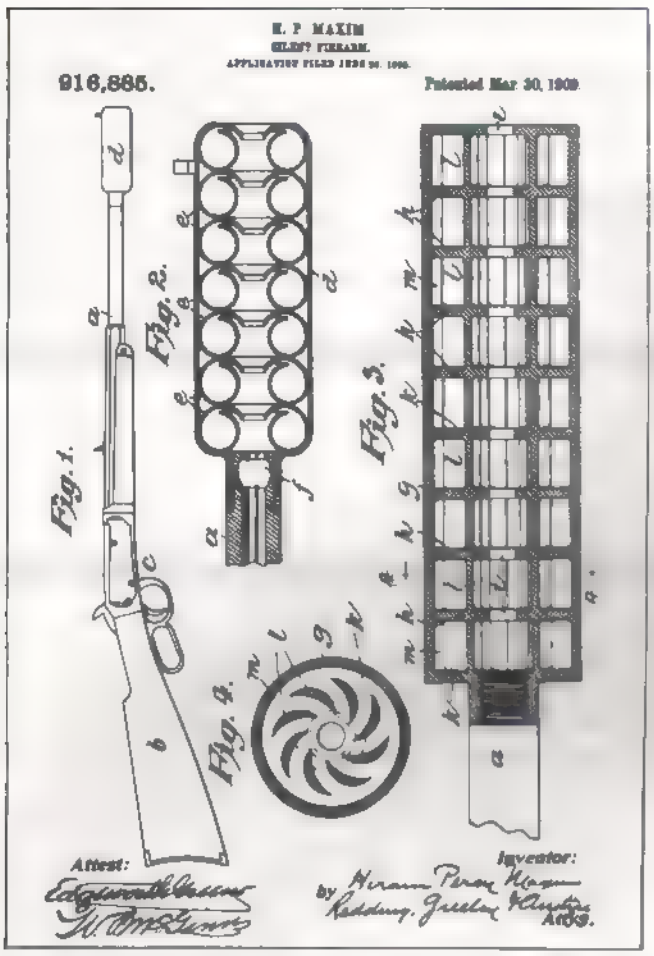
A few of the more interesting designs are discussed here and illustrated by their patent drawings. As can be seen, the period from about 1910 to 1920 was the Golden Age of silencer design as far as proliferation is concerned. But for truly effective silencers, the era of World War II until the 1970's is undoubtedly the real Golden Age, since that is the era that produced the O.S.S. silenced High Standard HD Military, Mitch Werbell's Sionics designs, the Automatic Weapons Company designs, etc. These examples are, of course, the successes. There were also numerous failures along the way, among them a rather unorthodox 1939 design of a silencer for everything from anti-tank and 75mm guns on up to small naval guns. It might have worked, but in order to do so it would have to have been built in such a size as to render it virtually immovable.

Although not every silencer developed or patent granted between 1910 and 1960 is included, the most interesting and important are shown in order to give the serious student of the subject a broad overview of silencer design in the U.S. Those listed herein are presented in chronological order, rather than by inventor, since this gives a clearer picture of the over-all trend in silencer development, hence there will be two listings for Hiram Maxim, two for R. A. Moore (not to be confused with Herbert Moore), etc.

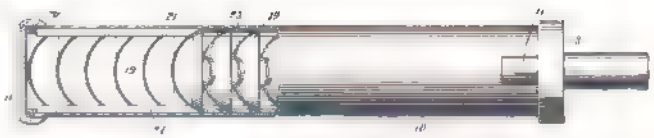
One must also remember that silencers were being developed in other countries as well, principally in Europe, at this time and that their inventors' concepts were sometimes different than our own. For an excellent study of silencers both here and abroad, refer to *Firearm Silencers, Volume Two*, by John A. Minnery (Desert Publications, 1981).

Hiram P. Maxim, 1909

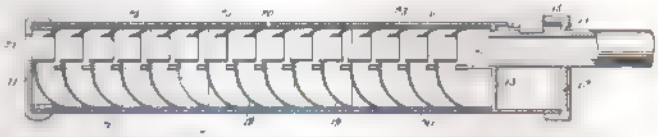
Although Maxim's first firearm silencer patent preceded the one shown here by a year, it was for a rather crude affair which never went into production. It was a rather naive attempt to silence a firearm by trapping the burning powder gases near the muzzle with a valve system activated by those gases.



Hiram P. Maxim's original application for a patent on his Model 1909 silencer.



Top view of Stinson silencer with cutaway.



Cross section of Stinson silencer.

Cross section at line 4-4.

Rear view.

Front view of disk.

STINSON SILENCER
10. Tubular casing.
11. Front cap.
12. Rear cap.
13. Wall.
14. Opening.
15. Radial slot.
16. Pressed out portion of threaded cap flange.
17. Opening.
18. Shoulder.
19. Dish-shaped disk.
20. Spacer rings.
21. Splines, indexing disks inside casing.
22. Indexing slots in disks (for splines).
23. Ring of disk.
24. Muzzle of silencer.

The Maxim Model 1909 was never very widely distributed, but was a definite improvement over Maxim's first attempt and was at least as effective as other silencers of the day. Maxim's idea with the Model 1909 was to trap and whirl the powder gases around inside the silencer, allowing them to expand and cool before entering the atmosphere.

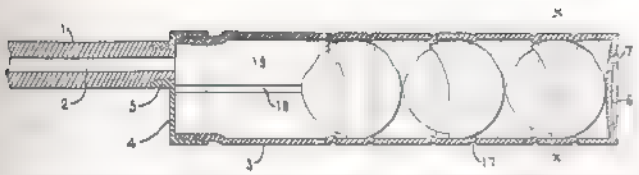
J. H. Stinson, 1909

James H. Stinson's "Gun Muffler" is actually representative of the silencers of its time, except for one important difference. Most others with dish-shaped baffles had the convex side facing to the rear to trap the gas. The Stinson silencer placed the concave side to the rear to not only trap the gases, but to force them rearward when they hit the baffles' surfaces,

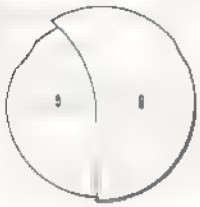
George F. Childress, 1910

In his patent application, Mr. Childress claimed that his silencer was "less easily clogged with dirt than the majority of similar devices, since the gases are retarded in comparatively large spaces."

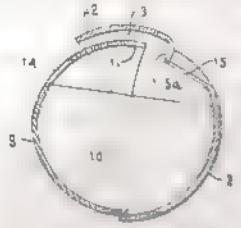
The tube of Childress's silencer contained, in most cases, three large spheres, each of which was made up of two hemispheres of unequal size. Once the powder gases entered the expansion chamber, they flowed into the hemispheres where they were whirled and further expanded, finally dissipating into the atmosphere through the muzzle. Note in the patent drawing that the bullet aperture is offset from the centerline of the silencer tube, just as in the Maxim Model 1910. Apparently Childress also recognized the value of being able to use a weapon's factory sights with a silencer.



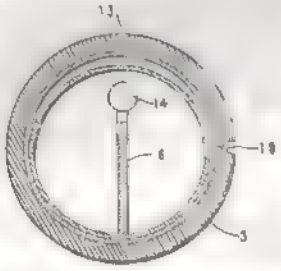
Sectional view of mounted Childress silencer.



Side view of sphere.



Cross section of sphere.



Cross section of Childress silencer at line X-X.

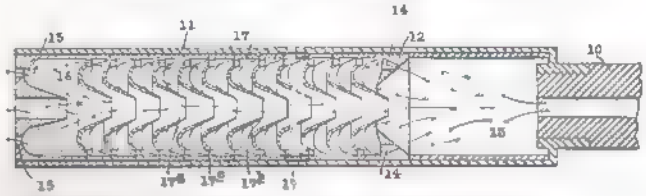
CHILDRESS SILENCER

1. Barrel of gun.
2. Bore.
3. Silencer casing.
4. Rear cap.
5. Internally threaded collar.
6. End wall (dished to withstand pressure).
7. Bullet aperture.
8. Larger hemisphere.
9. Smaller hemisphere.
10. Overlap of hemispheres.
11. Smaller hemisphere tongue.
12. Larger hemisphere tongue.
13. Gas passageway.
14. Bullet entrance aperture.
15. Bullet exit aperture.
16. Vertical partition.
17. Annular indexing groove.
18. Indexing tongue, to prevent transverse rotation.
19. Expansion chamber.

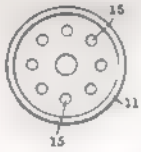
C. H. Kenney, 1910

Although quite conventional, the Kenney silencer was one of the more practical designs of its day while still incorporating a couple of unique features. It provided a pre-expansion chamber for powder gases and contained hat-shaped disks whose sharp edges were supposed to "slice" the

Kenney silencer on rifle or shotgun.

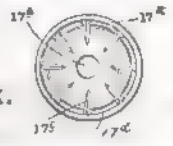


Cross section of Kenney silencer.

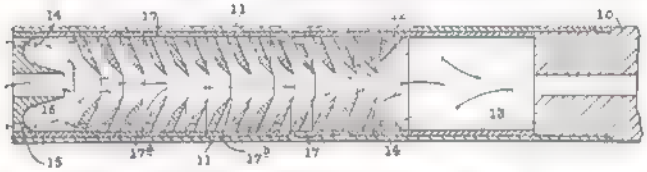


Muzzle view.

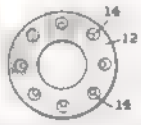
Cross section of disk.



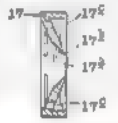
Rear view of disk.



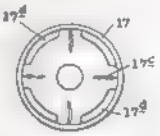
Cross section of Kenney silencer with modfied disks.



Rear view of impact plate.



Cross section of disk.



Rear view of disk.

KENNEY SILENCER

10. Barrel of rifle or shotgun.
11. Outer cylindrical housing of silencer.
12. Perforated ring.
13. Chamber.
14. Openings in ring.
15. Openings for exhaust gases.
16. Expansion chamber.
17. Cup-shaped shearing disks.
17a. Holes in disks.
17b. Annular knife-like edge of disk.
17c. Radial web or fin of disk.
17d. Cutaway portion of disk.

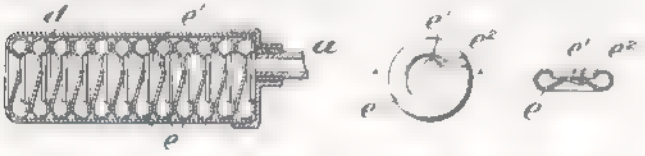
gases and divert them to the outer edges, from whence they were finally exhausted into the air.

While most silencer proponents felt that it was necessary for a silencer to whirl the gases in order for it to work, Kenney believed exactly the opposite and actually had a fin on the back of each disk to prevent the gases from swirling. More knowledgeable than most would-be silencer inventors, Kenney referred to the gas being dissipated by the silencer, instead of retained. He said this fact made the silencer acceptable for use on automatic or rapid fire arms.

The Hopkins & Allen "Noiseless" was the production version of Kenney's silencer. It was factory fitted to some H&A rifles as they came off the production line.

Hiram P. Maxim, 1910

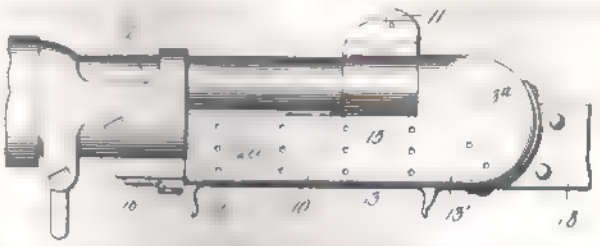
Although bearing the 1909 patent date, the eccentric Maxim Model 1910 didn't come out until the following year. it's probably the most prolific commercial silencer that was ever marketed. It was redesigned from the Model 1909 as Maxim felt the latter let a small shaft of gas exit from the muzzle directly behind the projectile and he wanted to prevent this.



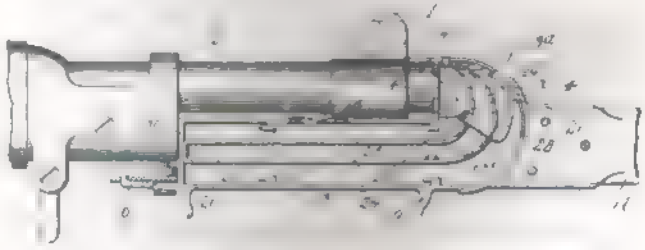
The most common of the several variations of Maxim Model 1910 silencers is shown above. Silencers of this type were once sold over the counter by many hardware and sporting goods stores.

Another variation of the Maxim 1910. Note the difference in the baffles, although the tube appears to be the same.

The Model 1910 was relatively effective for its time and sold quite well. Its main advantage was its eccentric construction which allowed the use of a weapon's factory sights. It attached to the barrel by means of an interrupted thread on both silencer and muzzle end of the rifle. The Model 1910's main disadvantage is that it was a permanent assembly which couldn't be dismantled for cleaning. In a time prior to non-corrosive primers, the Model 1910 had a rather short service life unless it was frequently cleaned by placing it under a running hot water faucet as Maxim suggested.



First model Moore silencer mounted on M1903 Springfield rifle.

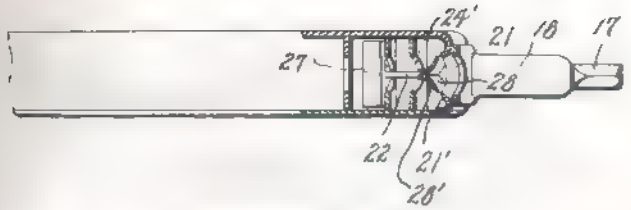


Moore silencer with sideplate removed.

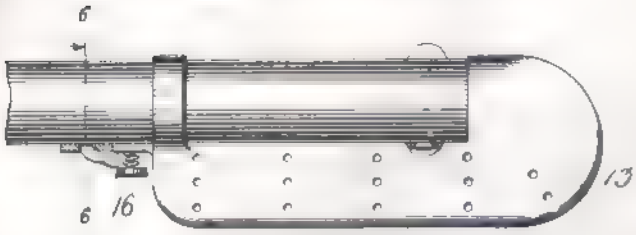
Robert A. Moore, 1910

A Chicagoan, Mr. Moore and the Moore Silencer Company of New York City were granted a patent for their first silencer design in 1910. This interesting silencer was intended for use on large caliber sporting or military rifles, with the latter being fitted with a bayonet. Unlike most silencers of the day, the Moore design had removable sideplates, a must for prolonged military use.

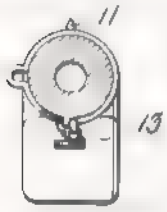
Model 1910 Maxim silencer mounted on a rifle.



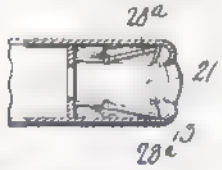
Section on line 4-4.



Moore silencer for sporting rifles was basically the same as the military silencer, except it had no provision for attaching a bayonet.



Section, line 6-6.

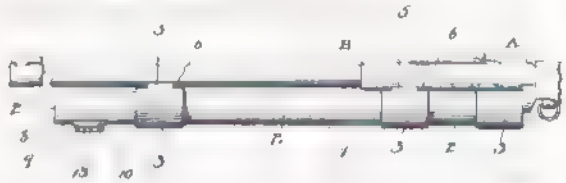


Section of modified gas divider.

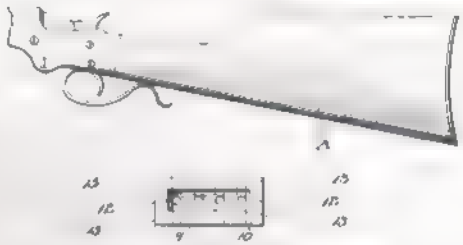
FIRST MODEL MOORE SILENCER

10. Muzzle of rifle.
11. Front sight.
12. Handguard retaining band.
13. Hollow casing.
13a. Hooked muzzle end of casing.
13b. Rear end of casing.
13'. Removable side plate.
13". Interlocking lugs of sideplate.
14. Lip fitting over gun muzzle.
15. Spring dog to retain silencer on barrel band.
16. Spring dog to retain silencer on bayonet lug.
17. Hilt of bayonet blade.
18. Blade support lugs.
19. Handguards (for use when silencer is used as a bayonet).
20. Vents.
21. Bore of silencer.
21'. Bent portion of casing at bore.
22. Gas divider.
22'. Pivot point of gas divider.
23. Partitions.
23'. Opening of partition.
24. Partition.
24'. Opening of partition.
25. End of partition, connected to others.
26. End of partition, connected to others.
27. Broad moving wing.
28. End portion of moving wing.
28a. Concave surfaces of moving wing.
29. Concave surfaces.

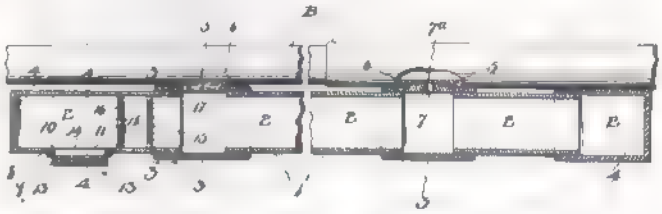
The Moore silencer consisted of a gas chamber beneath the muzzle of the rifle. A series of baffles was supposed to deflect the burning gases, or muzzle blast, downward into the chamber. A movable shutter was then activated by the gases, forcing fresh air into the chamber to cool the gases. They would then exit from the chamber through exhaust holes cut in its sides.



Side view of rifle barrel with Shipley silencer.



Detail of perforated members.



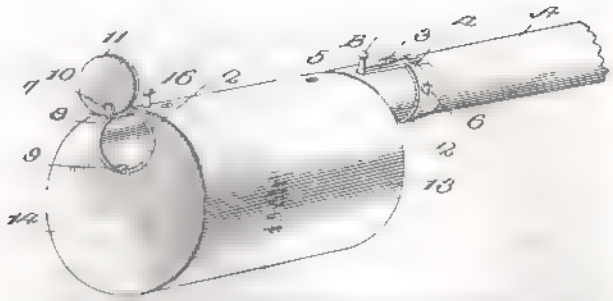
Cross section of Shipley silencer mounted on rifle barrel.

Cross section of line 3-3. Cross section of line 4-4.

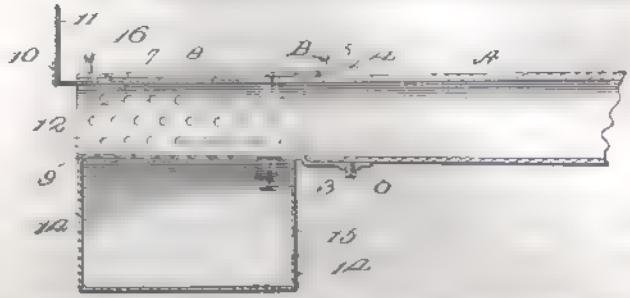
Detail of perforated members.

SHIPLEY SILENCER

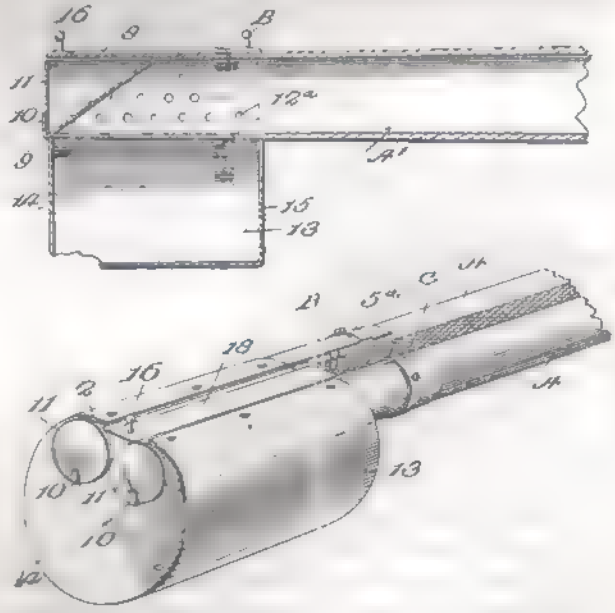
A. Rifle to which silencer is attached.
B. Rifle barrel with silencer attached.
1. Sections of tubing assembled into casing.
2. Individual sections of tubing.
3. Coupling rings.
4. End sections of tubing, with closed ends.
5. Dovetail on coupling rings.
6. Dovetail slots on barrel.
7. Opening in tube through coupling ring.
7a. Opening in barrel.
8. Wedge-shaped notch.
9. Block with wedge-shaped base.
10. Wedge portion of block.
11. Elongated socket.
12. Holes leading down from elongated socket.
13. Transverse holes through block.
14. Elongated slot which aligns with elongated socket.
15. Notched disk.
16. Disk with openings.
17. Notches in disk.
18. Openings in disk.



Craven silencer for single barrel shotgun.



Cross section of owner installed (above) and factory installed (below) Craven silencers.



Craven silencer for double barrel shotgun.

Andy C. Shipley, 1910

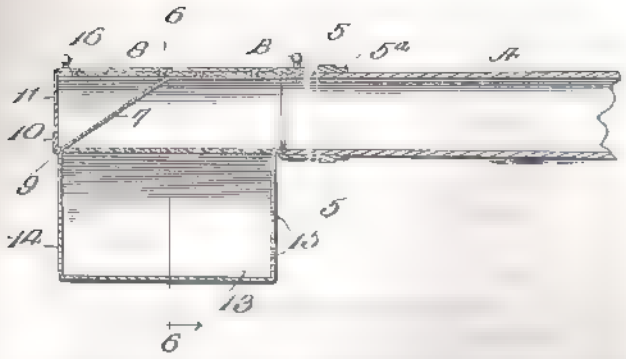
Shipley's idea was to tap the burning powder gases from the bottom of the barrel and bleed them into an expansion chamber below, then let the gas dissipate into the open air. The basic idea may have been sound, but the small hole drilled into the bottom of the barrel wasn't large enough to bleed off enough gas to do much good. Also, the inventor seemed to be unaware of the realities of bullet crack, even though there were a few supersonic cartridges around back then. In his patent application he wrote:

". . . it will be apparent that the report that usually accompanies the discharge of a rifle or other firearm is effectually avoided and the position of the marksman unbetrayed to game or an adversary a short distance away."

Harry Craven, 1911

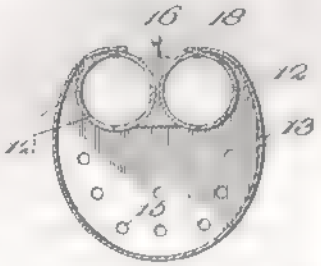
Although a bit bizarre in practical application, the theoretical concept of the Craven shotgun silencer was basically sound. A can full of holes is placed on the end of a gun's barrel and the bullet (in this case, shot) aperture at the front of the silencer is covered by a spring-loaded disk valve. When the weapon is fired, the wad or shot would blow the disk valve upward and out of the way, where it would remain until the shot had passed out of the muzzle. Spring pressure would then snap the disk valve back into place, trapping the gases and forcing them to dissipate out into the air through the holes in the outer casing.

Craven developed several variations on his basic silencer design, including one for a double barreled shotgun. However, his claim of the silencer's usefulness on a rifle is to be doubted since some very strange things could easily have happened if the bullet's point reached the disk valve before the overall diameter could trip the valve's spring.

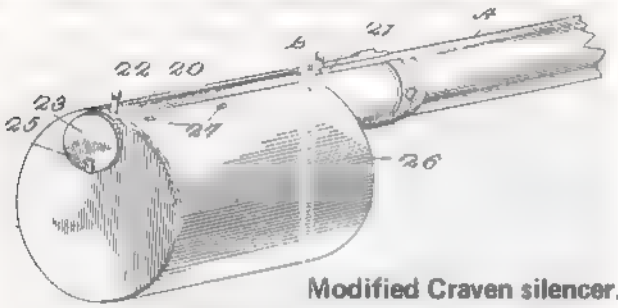


Cross section of Craven silencer for double barrel shotgun.

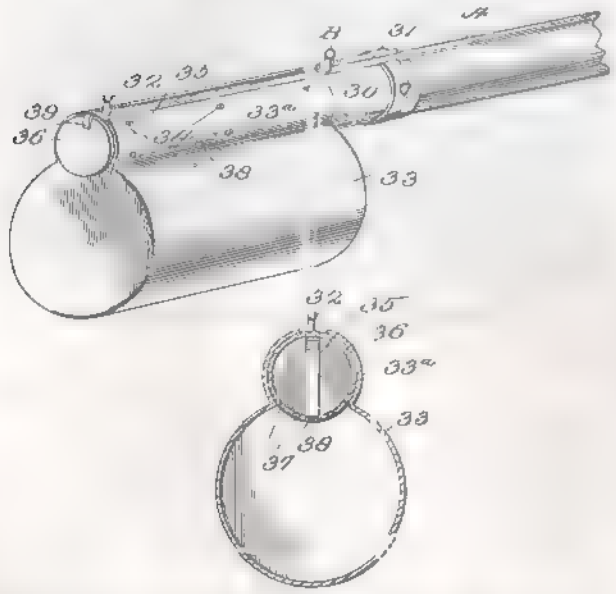
Cross section, line 5-5.



Cross section, line 6-6.



Modified Craven silencer.



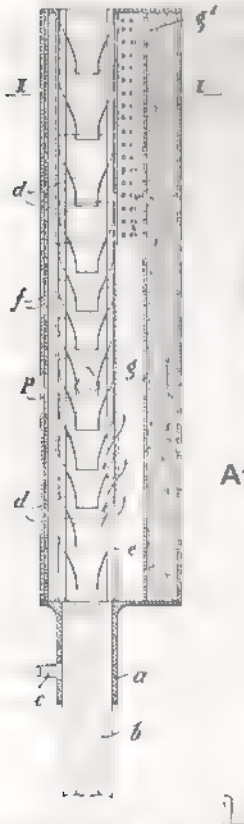
Another modified Craven silencer, with cross section looking toward the muzzle.

CRAVEN SILENCER

A. Gun barrel.
AA. Gun barrel.
A1. Gun barrel specifically made for Craven silencer.
B. Front sight.
C. Sighting rib on double barrel shotgun.
(No No. 1)
2. Auxiliary barrel extension.
3. Enlarged section or barrel adapter, countersunk for muzzle.
4. Reinforced section of adapter.
5. Slot to accept front sight.
6. Retaining screws to attach assembly to barrel.
7. Spring which opens and closes disk valve.
8. Groove for spring (7).
9. Groove for spring (7).
10. Angular bend in spring.
11. Disk valve.
12. Perforations in barrel extension.
12a. Perforations in gun barrel specifically made for Craven silencer.
13. Hollow chamber, aluminum construction.
14. Chamber end plate.
15. Perforations in end plates.
16. Additional front sight.
16a. Additional front sight, double barrel gun;
(No No. 17)
18. Partition separating barrel extensions on double barrel silencer.
(No No. 19)
20. Barrel extensions similar to 2 above.
21. Slot in barrel extension.
22. Additional front sight.
23. Disk valve.
(No No. 24)
25. Angular bend in spring.
26. Hollow chamber.
27. Screws and rivets.
(No Nos. 28 & 29)
30. Barrel extension.
31. Slot in barrel extension.
32. Extra front sight.
33. Hollow chamber.
33a. Walls of hollow chamber bent to fit snugly around barrel extension.
34. Screws or rivets.
35. Spring which opens and closes disk valve (moved by projectile).
36. Disk valve.
(No No. 37)
38. Slot for spring.
39. Angular bend in spring.

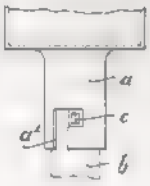
Eugene Thurler, 1911

Thurler was granted a U.S. patent for his silencer design in the fall of 1911, and it saw limited production in Europe shortly thereafter (Thurler lived in Switzerland). Instead of using spacer rings between his deflecting cones like most other silencer designers, Thurler suspended the cones on four lateral rods. This was necessary since the gases were expected to pass through the cones and the perforated tube that surrounded them into the void space between that tube and the eccentric outer casing. In some models, this void space was filled with aluminum shavings and there was a second perforated tube surrounding them. Slots in the outer housing allowed the gases to finally escape into the atmosphere. "Finally" as used here is a relative term, since the entire process was accomplished in milliseconds.



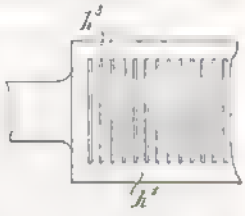
Cross section, Thurler silencer.

Cross section, line II-II.



Attaching notch.

End view, disk-cone.



Alternate construction.

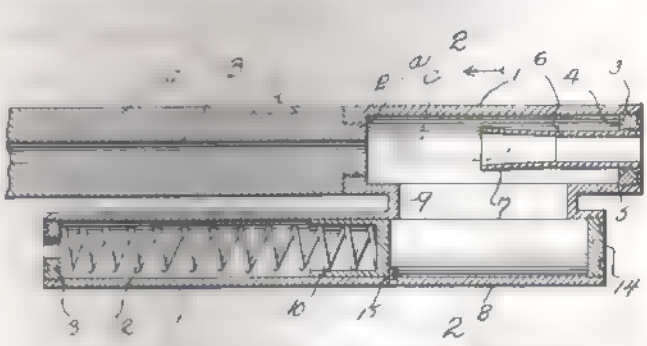
Modified disk-cone assembly.

THURLER SILENCER

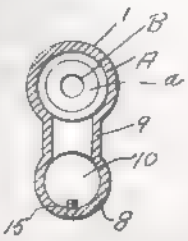
- P. Projectile.
- a. Sleeve.
- a'. Angular slot.
- b. Barrel of gun.
- c. Gun sight.
- d. Gas deflecting disk-cones.
- e. Tube.
- e'. Tube.
- f. Indexing rods for disk-cones.
- g. Second tube.
- g'. Perforated part of second tube.
- h. Third tube (forward portion is perforated).
- h'. Outer tube filled with aluminum shavings.
- h2. Network.
- h3. Gas exhaust slots in outer tube.

Herbert Moore, 1912

Mr. Moore's unusual silencer consisted of a short tube that attached to the barrel of a rifle and a smaller diameter, longer tube that was slung below the barrel. When the weapon was fired, the gases were supposed to flow into the lower tube and force a spring-loaded plunger rearward. When the plunger moved forward again, it would push the gases back into the top tube, from which they would be expelled into the atmosphere. The inventor claimed that this silencer would significantly lessen the recoil of the arm and would also capture all the smoke produced by black powder. It was supposed to retain the carbon particles and release



Cross section, Herbert Moore silencer.

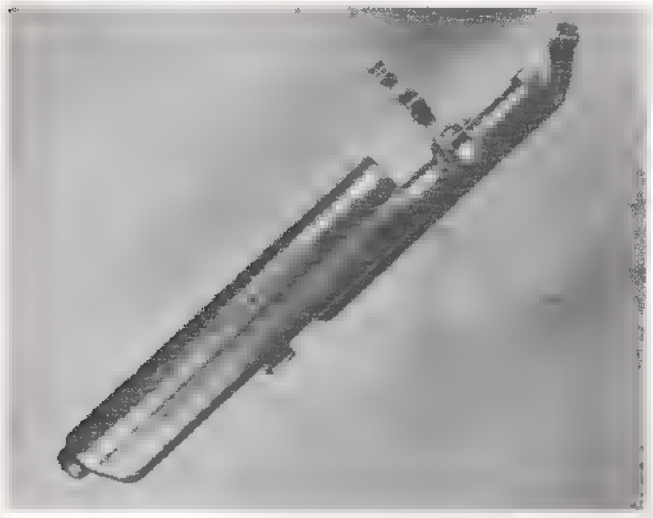


Section 2-2 of above.

only clear gas. It just goes to show you that something doesn't really have to work to be patentable, it just has to be different and *look* like it will work.

HERBERT MOORE SILENCER

A. Muzzle end of gun barrel.
B. Bore of barrel.
C. Projectile.
1. Cylindrical casing.
2. Threaded, extended flange on casing.
2a. Threaded muzzle of gun.
3. Threaded portion of muzzle end of silencer casing.
4. Threaded ring.
5. Inner threads on ring.
6. Tubular member.
7. Flare in tubular member.
8. Tubular chamber.
9. Connecting casing.
10. Sliding plunger.
11. Extension of tubular chamber.
12. Coil spring.
13. Annular plug.
14. Screw plug (removable for cleaning).
15. Plunger retaining screw.

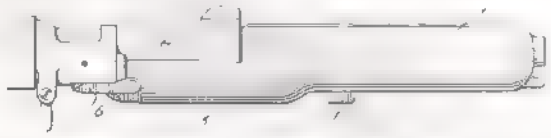


Second Model Moore Silencer.

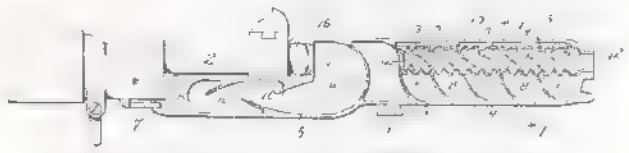
Robert Moore, 1912

A patent for a second, more sophisticated silencer was granted to Robert Moore in 1912. The design must have worked reasonably well for it was given thorough testing by the U.S. Ordnance Department and two years later, in 1914, approximately 100 were ordered for field tests. In his writings, Gen. Julian S. Hatcher refers to the attention given both the Maxim and the Moore designs in this time period. The Army issued two M1903 Springfield rifles equipped with silencers to each infantry company prior to World War I, but later reversed its stand. Its reasoning was that the enemy is less aggressive if he knows he's being shot at. Silencers were then relegated to special roles such as sniping.

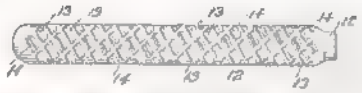
The Second Model Moore silencer was more sophisticated than the original. Gases were initially trapped in a large chamber under the muzzle, from which they expanded into a second chamber, then through a series of baffles into five smaller chambers. A production model is shown in the accompanying photo.



Second Model Moore silencer mounted on M1903 Springfield rifle.



Cutaway of Second Model Moore silencer.



Detail of tubular baffle.

Section on line 4-4.

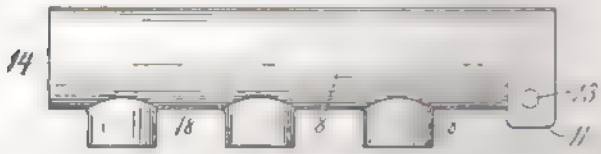
SECOND MODEL MOORE SILENCER

1. Oval casing.
1'. Bayonet stud on silencer.
2. Rifle barrel.
3. Bore of silencer.
4. Recess for rifle barrel in rear of silencer.
5. Hollow trap extension.
6. Rifle bayonet stud engaging member.
7. Rifle bayonet stud.
8. Curved partitions.
9. Chambers.
10. Inclined webs.
11. Partition across casing.
12. Tubular baffle.
12'. Snug-fitting end of tubular baffle.
13. Blades or fins.
14. Inclined fins.
15. Spiral spaces.
16. Muzzle cap to protect muzzle of gun.

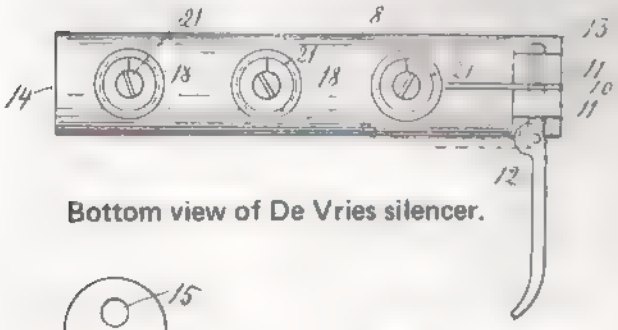
Peter J. De Vries, 1914

De Vries' silencer was unusual for the period in that it could be attached to a standard firearm without any alteration, such as threading the barrel. It was attached by a unique cam lock.

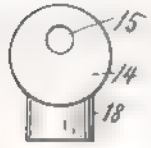
Like most silencer inventors of the day, De Vries thought that it was necessary to spin the gases in order to silence a gun's report. The gases were trapped in a large main chamber, then bled out through three large holes in the bottom which contained special inserts that were similar in design to wood drill bits, which would spin the gases. Although designed for use on small caliber arms, the inventor claimed the idea could be adapted to any caliber.



Side view of De Vries silencer.

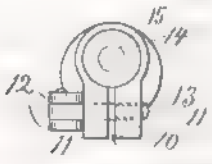


Bottom view of De Vries silencer.

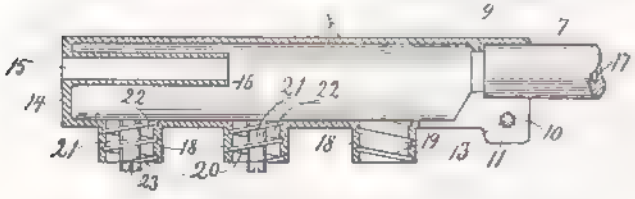


Front view.

Detail of screw plug for valve.



Rear, with clamp lever on left side.



Cross section of De Vries silencer.

DE VRIES SILENCER
(No Nos. 1-6)

7. Muzzle of gun.
8. Body of silencer.
9. Collar which butts against muzzle.
10. Slit to allow tightening.
11. "Cheeks" of silencer which fit against barrel.
12. Tightening cam lever.
13. Adjusting screw for tightening cam.
14. Closed muzzle of silencer.
15. Hole in muzzle of silencer.
16. Sleeve extending inside the silencer from the muzzle.
17. Bore of gun.
18. Gas outlet tubes or "valves".
19. Screw thread in valve.
20. Deep thread of valve plug.
21. Valve plug.
22. Spiral duct in valve plug.
23. Notch for screwdriver, to remove valve plug for cleaning.

W. E. Westfall, 1914

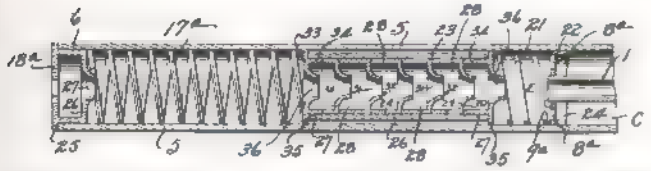
Mr. Westfall was far enough ahead of his time to realize that a successful silencer needed to be capable of containing a very large volume of gas. He solved the problem by designing a silencer which completely surrounded the barrel, in addition to extending well beyond the muzzle. The gases first entered a large expansion chamber in front of the muzzle, then they forced open a rather unusual check valve, which allowed them to expand into the chamber which surrounded the barrel. The return spring on the check valve caused the gases to lose energy by forcing them to work against it. The check valve was available with either flat or cone shaped baffles, the latter being more effective in catching the gas.

Whether the Westfall silencer was ever marketed or even extensively tested isn't known, but it's an interesting design which should have worked far better than some others of its day.

Cross section, Westfall silencer.

Cross section, check valve.

Section on line 3-3.



Cross section, enlarged view of modified Westfall silencer.

WESTFALL SILENCER
(No A or B)

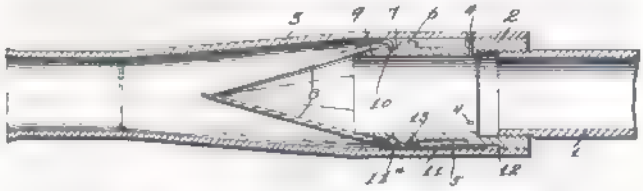
C. Long gas chamber.
D. Gas arresting chamber.
S. Rifle.
1. Gun barrel.
2. Annular ring formed on base of barrel.
3. Threaded portion of 2, above.
4. Threaded end of silencer casing.
5. Silencer casing.
6. Exhaust end of silencer casing.
7. Removable spacing sleeve.
8. Projecting spokes.
9. Collar.
10. Inturned abutment flange, seat and stop for sliding check valve.
11. Sliding check valve.
12. Valve body.
13. Disk-like end cap.
14. Baffle disks.
15. Opening in baffle disk.
16. Openings in end cap.
17. Resetting spring.
18. End plug.
19. Air chamber.
20. Openings.
21. Shock absorbing spring.
22. Centering spider.
23. Check valve.
24. Ring.
25. Peripheral cap flange.
26. Inner wall.
27. Threads on valve casing.
28. Removable and replaceable baffle members.
29. Side walls.
30. Bottom walls.
31. Conical portion.
32. Openings.
33. Holding cap member.
34. Threaded neck of cap member.
35. Bearing flange.
36. Conical portion.

Seth Jones, 1915

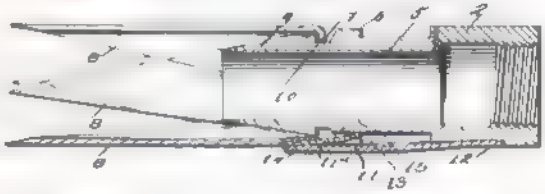
One of the most remarkable silencer designs of the pre-World War I era was that of Seth Jones of Illinois. Unfortunately, it's also one of the most questionable as far as effectiveness or even safety is concerned.

Externally, the Jones silencer reminds one of an adjustable choke, which is appropriate enough since it was designed for use on shotguns. But in-

Side view of shotgun with Jones silencer.

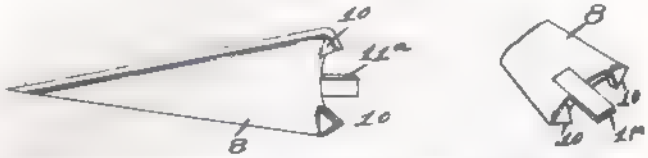


Cross section of silencer and barrel.



Cross section of silencer less casing.

Detail of silencer body.



Triangular closure lips, which were supposed to retain gas and sound.

JONES SILENCER.

1. Muzzle of gun.
2. Body of silencer.
3. Outer casing.
4. Retaining screw.
5. Reduced neck.
6. Annular rim.
7. Circumferential groove.
8. Closure lips, to retain gas.
9. Taper to allow lips to close tightly.

10. Bent lugs (ears) which retain lips.
11. Flat spring which closes lips.
11a. Tongue on spring.
12. Groove in body for flat spring.
13. Guide notches for lips.
14. Taper for extra springiness.
15. Groove for 11a.

ternally, it's a whole different ballgame. The shotgun's muzzle is enclosed by a cone made up of several parts cut into pie shaped triangles held together by flat springs. This cone is attached to a tube which is screwed onto the barrel of the shotgun, with an outer casing enclosing both cone and tube.

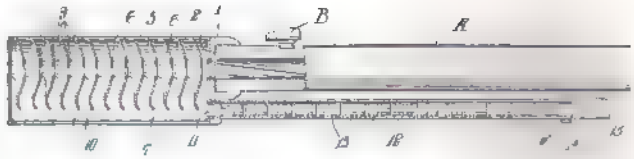
In function, the cone was supposedly forced apart by the charge of shot when the weapon was fired, allowing the shot and wad to pass through the opening, then snap closed again in time to trap the expanding powder gases inside. An interesting theory, but in fact the still expanding gases would have to go *somewhere* — either out through the now closed cone or through another outlet. If the springs holding the cone together *were* strong enough to keep it closed against the pressure exerted by the gases, one can only speculate on which would give way first, the barrel or the locking mechanism which kept the action closed.

All in all, the Jones silencer was an interesting if not successful concept, and the inventor should at least be credited with trying a different approach to the problem of silencing a weapon's report.

O. J. Bailey, 1916

Mr. Bailey's silencer was unusual for its day in that its inventor was concerned with cooling the gases to silence a weapon. Evidently he was unaware that rapidly expanding gases make noise, no matter what their temperature.

The Bailey silencer was basically rather conventional in design except for the ejecting tube beneath the gun's barrel. This tube was filled with screen baffles which were supposed to cool the gases before they escaped into the atmosphere. Forward of the muzzle, the silencer contained a large expansion chamber containing a number of baffles which were designed to resist breakage when they expanded during rapid fire. Bailey's silencer was also unusual in that it was one of the very few designs to feature a gas-tight sealing gasket between the silencer and the muzzle of the gun.



Cross section, Bailey silencer mounted on rifle.

Front view. Detail of screen sleeve.

BAILEY SILENCER

A. Gun barrel.
B. Front sight.
1. Threaded coupling.
2. Gasket.
3. Outer casing.
4. Upper portion of casing.
5. Lower portion of casing.
6. Expansion chamber.
7. Gas ejecting chamber.
8. Frusto-conical diaphragms.
9. Attaching flanges for diaphragms.
10. Gas deflecting lip.
11. Opening at rear of ejection chamber.
12. Ejecting tube.
13. Screen cylinders or sleeves.
14. Screen mantle.
15. Foraminous wall.
16. Collar.

Eugene W. Thompson, 1916

One silencer designer who was either on the wrong track or who was away ahead of his time (as he would still be today) was Eugene W. Thompson. According to this Connecticut Yankee, you didn't have to trap, spin or otherwise slow down powder gases to silence a weapon. In his patent application, Thompson said: "It has been found that, it is only necessary to construct the bore substantially twice the length of the cartridge, for the projectile receives its greatest force instantly at the time of the explosion." If Thompson had a special type of cartridge and propellant in mind, he should have patented *them*, for such a combination is unknown even today. The closest we have come is in some designs that shorten and/or perforate the barrel to allow gases to escape before the bullet reaches the muzzle (see the O.S.S. designs in the second chap-

ter). This reduces supersonic bullets to subsonic speeds and eliminates bullet crack.

Basically, Thompson's original design was for a gun/silencer combination that had a barrel length only a few times that of the cartridge. A long assemblage of perforated spools in the silencer was used to trap and dissipate the gas. This silencer may very well have been rather quiet by 1916 standards, although velocity and accuracy would have suffered to make it possible.

Cross section, First Model Thompson silencer.

Perforated spool.

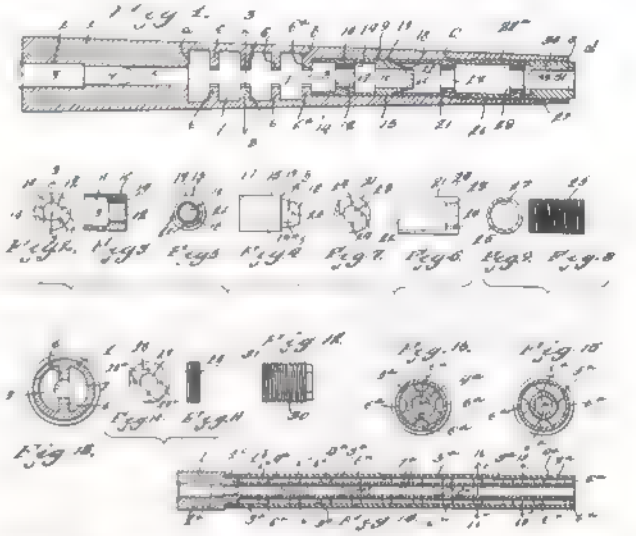
Spacing ring.

FIRST MODEL THOMPSON SILENCER

1. Barrel of gun.
2. Breech portion of barrel.
3. Bore of gun.
4. Cartridge.
5. Bore forward of breech portion of barrel.
6. Perforated spools.
7. Spacing rings.
8. Body of spool.
9. Flange of spool.
10. Perforations in spool body.
11. Perforations in spool flange.
12. Chambers between spools.
13. Chambers around spools.
14. Bore of spool.
15. Retaining cup or plug.
16. Shoulder at breech end of barrel.

Eugene W. Thompson, 1917

Our undaunted Connecticut Yankee may well have smelled the powdersmoke of war coming for the U.S. in 1916 when he dreamed this one up. Basically similar to his first patented silencer, Thompson's later design featured a greater variety of parts, but fewer of them. The very short bore length (in comparison to cartridge length) was still present, even though this silencer was designed for use on artillery and coastal defense guns! The U.S. issued a patent for it in June 1917, just a couple of months after the U.S. entered World War I. One can't help but speculate that some tired, anonimous clerk in the patent office might have had visions of this silencer/gun combination helping to keep the dreaded Huns from our shores should the tides of war change in favor of the Central Powers.



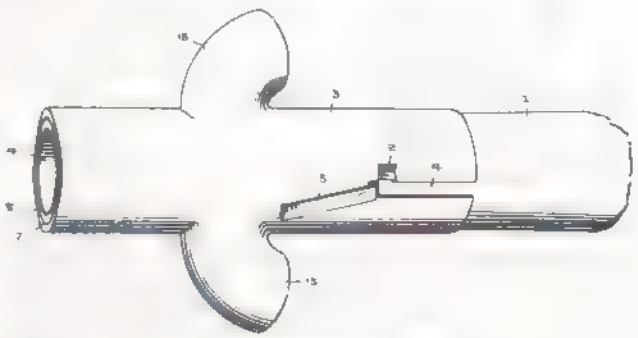
Second Model Thompson silencer. Note the greater variety, yet lesser total number, of parts as compared to the First Model Thompson.

R. M. Towson, 1917

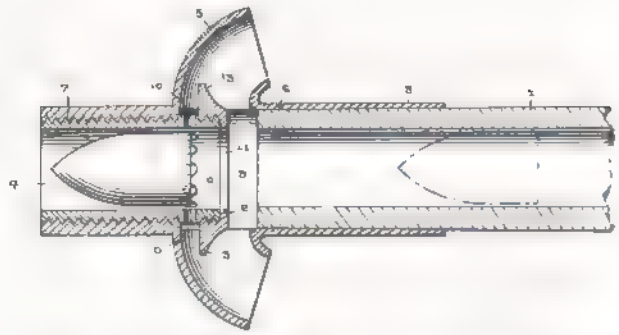
Mr. Towson's "recoil neutralizer and muffler" has to be one of the weirdest attempts to design a silencer on record, or at least it runs closely behind Seth Jones's design (see pages 29, 30).

Like Eugene Thompson's second silencer, the Towson recoil brake/silencer was designed primarily for use on field pieces, although the inventor claimed the design could be adapted to small arms as well.

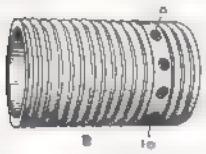
One look at the gas deflecting system which bleeds off gases and directs them to the rear should convince anyone that this contraption would actually be a noise enhancer for anyone firing a shoul-



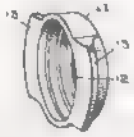
Towson recoil brake/silencer.



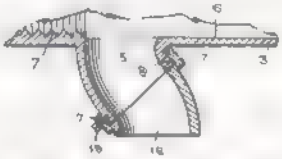
Cutaway of Towson recoil brake/silencer.



Detail of removable sleeve.



Detail of collar.



Detail of swivel extension.

TOWSON SILENCER

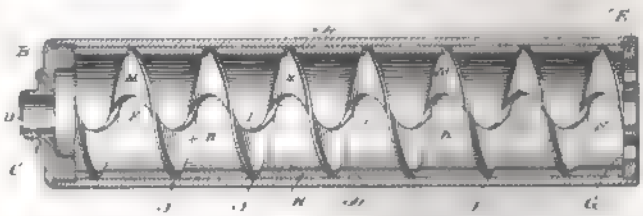
1. Muzzle of gun.
2. Gun sight.
3. Cylindrical casing.
4. Bayonet slot.
5. Latch member.
6. Bore.
7. Bore.
8. Sleeve.
9. Expansion chamber.
10. Ring of holes.
11. Collar.
12. Flange.
13. Deflecting shoulders.
14. Bore.
15. Tubular branches.
15'. Tubular branch.
16. Angular swivel extension.
17. Annular flange.
18. Annular groove.
19. Set screws.

der arm equipped with it. But as with several other bizarre ideas contained herein which didn't work, at least the inventor was trying to discover a new way of silencing guns, rather than just copying older, proven designs.

Anthony Fiala, 1919

One of the few silencers developed especially for use on a machine gun, the Fiala silencer was also supposed to be a flash hider. Its inventor was a major in the U.S. Army Ordnance Corps, so should have known a little more about weaponry than the average basement tinkerer.

The Fiala silencer was very conventional in appearance except for the eight small holes in the front plate which surrounded the exit hole for the bullet. Internally, it contained a unique spiral device (which Fiala called a muffling screw insert) which was enclosed by a spiral sleeve. Probably the most notable feature of the Fiala silencer was the ease with which it could be dismantled for cleaning and maintenance, further proof of the inventor's understanding of the military's needs.



Cross section of the Fiala silencer and flash hider.

Spiral screw retaining sleeve.

Front view of Fiala silencer.

FIALA SILENCER

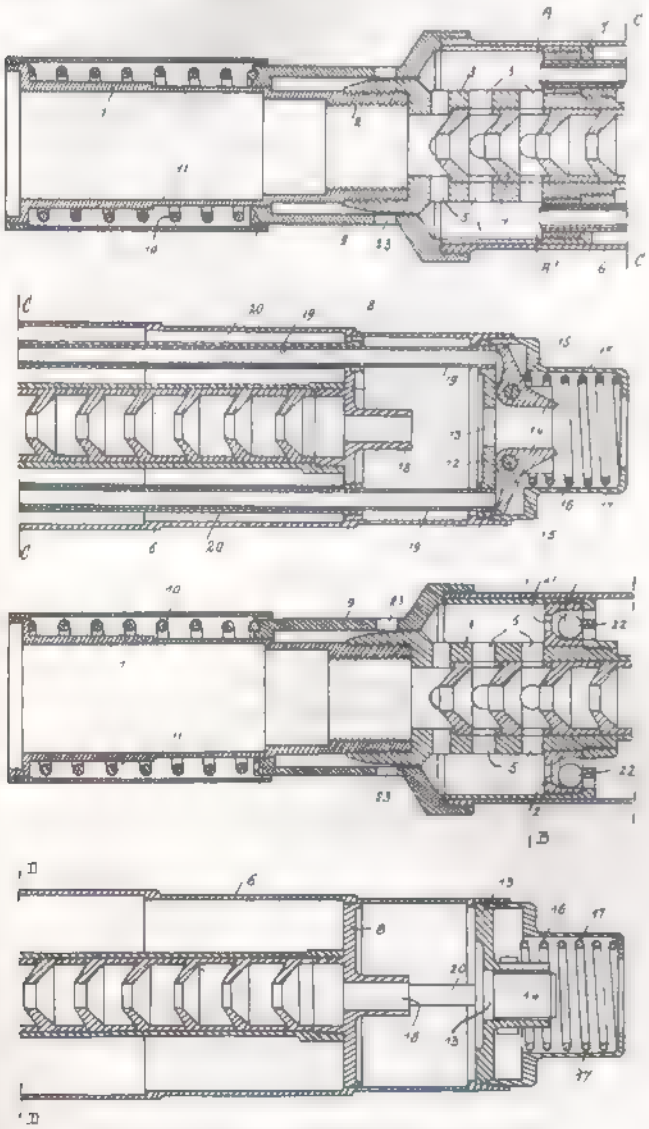
A. Outer casing.
B. Cap.
C. Threaded connecting arm.
D. Passage for projectile.
E. Disk.
F. Projectile passage in disk.
G. Openings in disk to exhaust gases.
H. Spiral shell or sleeve.
H'. Equally spaced grooves for muffling screw in spiral shell.
(No No. I)
J. Outer edge of muffling screw insert.

K. Muffling screw insert.
L. Opening in muffling screw for bullet's passage.
M. Impact surfaces of muffling screw insert.

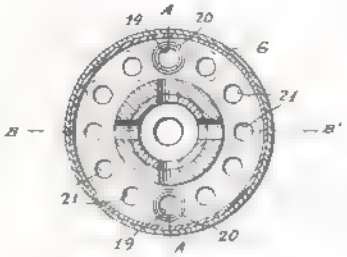
Zygmunt Wilman, 1927

A second machine gun silencer was developed by Zygmunt Wilman of Paris and patented in 1927. The inventor asserted that all other machine gun silencers either didn't work or else interfered with the automatic function of the mechanism. While quite complicated, the Wilman design nevertheless was a unique technological achievement for its day.

When the gun was fired, the bullet would pass through a series of open flap valves. Part of the gas which followed the bullet would expand into the rear chamber, then into the intermediate chamber under less pressure. The remainder of the gas

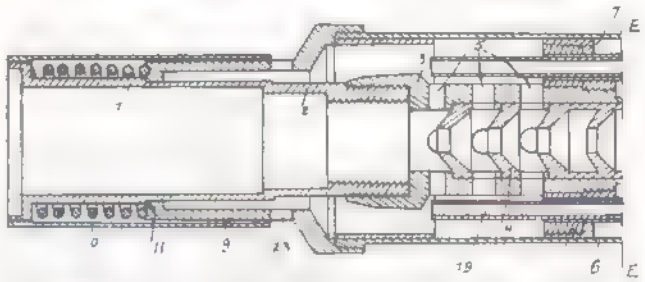


Cross section, Wilman silencer.

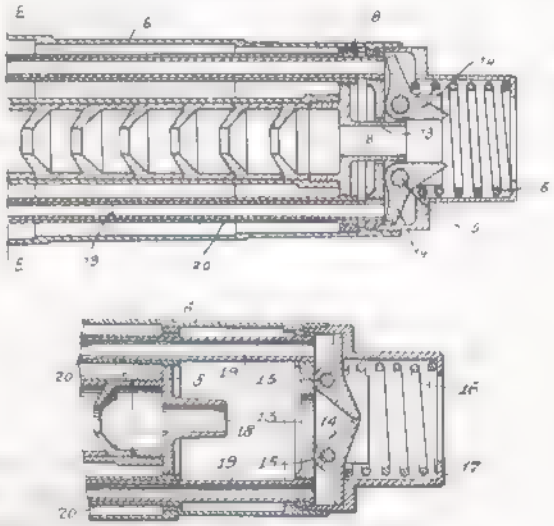


Cross section, line A-A.

Detail of flap valves.



Cross section of Wilman silencer in the recoil position.



Cross section, flap valves closed.

WILMAN SILENCER

1. Cylindrical portion.
2. Screw thread.
3. Central cylinder.
4. Gas catching baffles.
5. Vents.
6. Case around central cylinder.
7. Partitions.
8. Partition.

(Note: No. 8 also denotes screw threads on some drawings.)

9. Screw-attached part.
10. Spring.

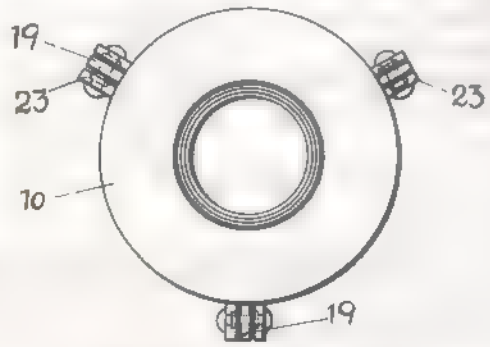
11. Boss.
12. Plate.
13. Orifice.
14. Flap valves.
15. Axis of flap valves.
16. Spring to hold flap valves open.
17. Spring housing.
18. Tube.
19. Two inner tubes.
20. External tubes.
21. Orifices.
22. Balls (valves).
23. Orifice.

would expand while passing through orifices which were located parallel to the bullet's path, finally filling up the front chamber. At this point, the gases in the external chamber were supposed to cause the flap valves to close.

It isn't known why the Wilman silencer never went into production. Anything as complicated as it was (compare its patent drawings to those of the Fiala machine gun silencer) would necessarily be very expensive to make, even when production in large quantities brought the per unit cost down. Perhaps that cost wasn't justifiable as the world went into a major depression in the 1930's, or maybe the design was just too complicated to actually work.

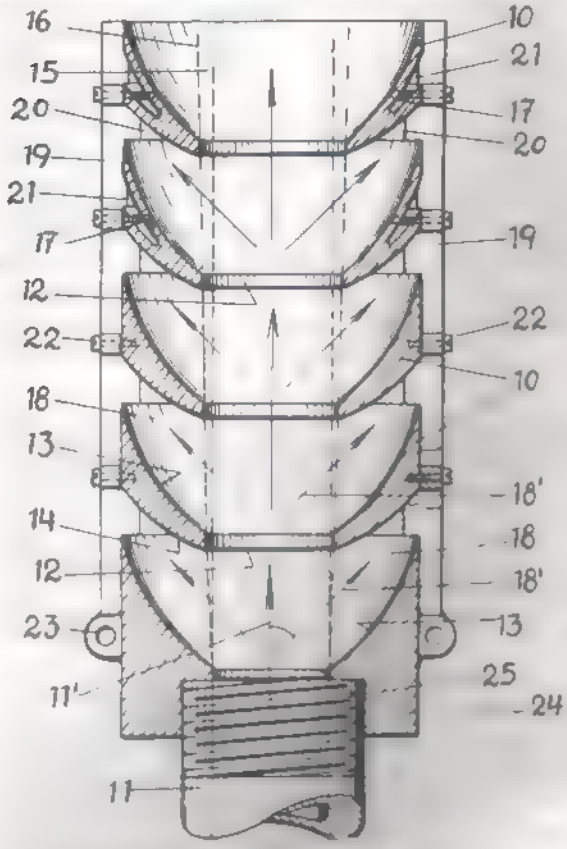
Samuel Bernat, 1930

If Wilman's silencer was overly complicated, it had its opposite in a very simple design by Samuel Bernat of Czechoslovakia. Bernat's silencer consisted of a series of cup-shaped disks held together by three metal strips. Although the invention's efficiency is doubtful, at least Bernat understood the basics of what a silencer was supposed to do when he wrote:



End view of Bernat silencer.

"Silencers are based on the fact that the impact of the escaping gas on the ambient air generates the sound and that the intensity of the sound is directly proportional to the inertia of the outflowing gas. By reducing the inertia the sound is deadened."



Cross section of Bernat silencer.

BERNAT SILENCER
(No Nos. 1-9)

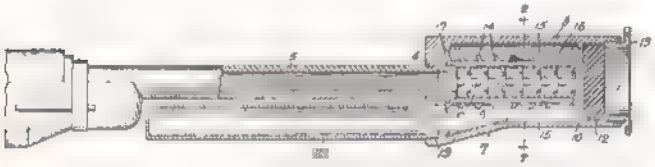
10. Set of disks.
11. Muzzle of gun.
11'. Centerline of projectile's path.
12. Central opening in disk.
13 Face of base.
14. Rear face of disks.
15. Cylinder composed of central openings in disks.
16. Taper.
17. Inward recess.
18. Spaces.
18'. Flow of gases in spaces.
19. Indexing strips which hold disks in place.
20. Inward projecting lugs.
21. Shorter lugs.
22. Screws securing strips to disks.
23. Hinge.
24. Base.

Brooks Walker, 1948

World War II brought tremendous progress in virtually all aspects of manufacturing, from improved metallurgy to faster production line techniques. It also brought major advances in the design of military equipment of all types, including literally everything from helmet straps and rations to naval and air ordnance — and the atomic bomb.

Armed with this new technology, Brooks Walker of California designed a new type of silencer which was both sophisticated and practical. It was also extremely simple in design. The Walker silencer consisted of a hollow tube filled with baffles just ahead of the gun's muzzle. A separate tube below the barrel served as an expansion chamber. The opening at the forward end of the top tube was sealed with a thick block of penetrable material, such as pliable rubber. This block would allow the bullet to pass through it, then would seal back up to check the burning gases.

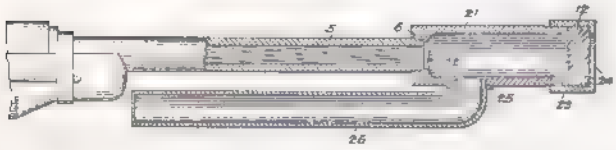
Walker was obviously thinking much more clearly than many silencer inventors, since he noted that to truly silence a weapon the bullet would have to be propelled at subsonic speeds and the mechanical noise of the firing pin or hammer muffled by cushioning. An alternative to the latter would be to fire the cartridge electrically.



Cross section of Brooks Walker silencer.

Sectional view on line 2-2.

End view, looking down bore.



Cross section, different style of Walker silencer.

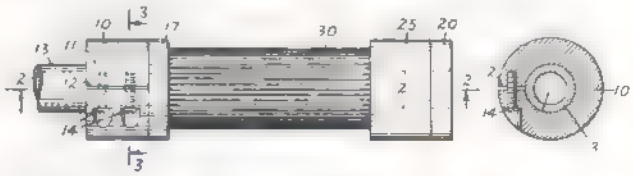
BROOKS WALKER SILENCER
(No Nos. 1-4)

5. Conventional rifle barrel.
6. Muzzle.
7. Outside of silencer.
8. Hollow body.
9. Restricted bore of hollow body.
10. Annular shoulder.
11. Thick block of penetrable material, such as rubber.
12. Band of rigid material.
13. Annular nut.
14. Rearward dished disks.
15. Retaining bolts for disks.
16. Spacing sleeves on bolts, to retain disks.
17. Threaded sockets for bolts.
18. Opening in disks for projectile.
19. Threaded portion.
20. Hollow cylinder, closed at one end.
21. Hollow body of different form of Walker silencer.
22. Restricted opening.
23. Flanged ring.
24. Restricted opening on flanged ring.
25. Threaded opening.
26. Hollow cylinder, closed at rear end.

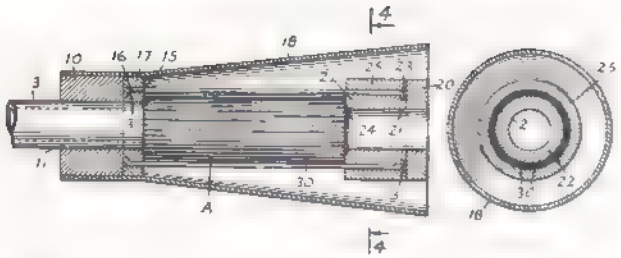
Cecil P. Caulkins, 1949

One of the most unusual silencer designs which could be considered at all practical was that of Cecil P. Caulkins. Rather than using a standard, rigid tube assembly, Caulkins used a circle constructed of wires strung longitudinally to form a flexible, sectioned cylinder. When a gun equipped with such a device is fired, pressure from the expanding powder gases forces the cylinder to bulge, parting the wires. An added bonus is the effect the wires would have on muzzle flash, which would be very effectively broken up by having to pass between the wires.

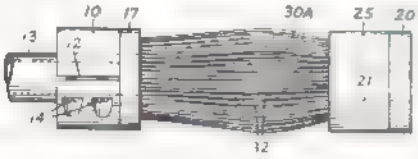
Due to the current status of firearm silencers, the inventor actually touted this silencer as an industrial muffler, particularly on internal combustion engines. The constant vibration of the wires would undoubtedly prevent carbon build-up very well.



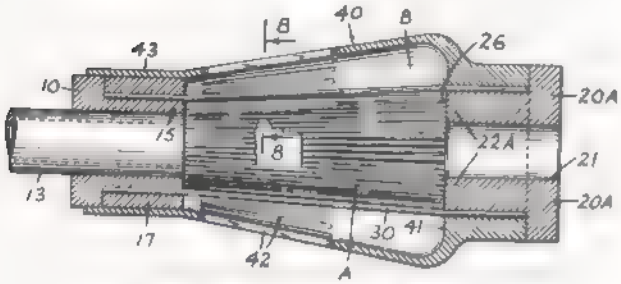
Caulkins silencer mounted on rifle. Section 3-3.



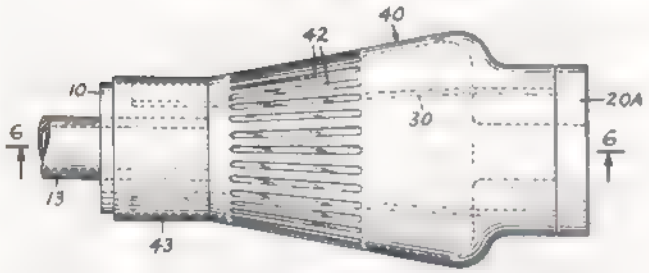
Cross section, silencer with shroud. Section 4-4.



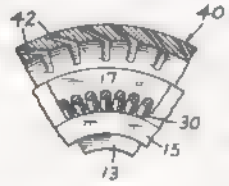
Caulkins silencer in operation.



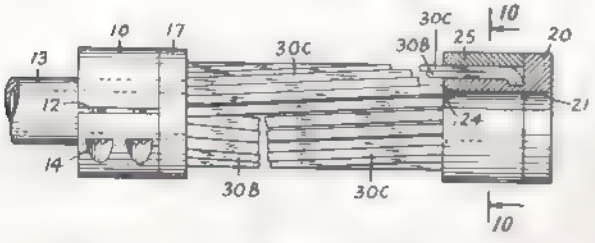
Modified Caulkins silencer.



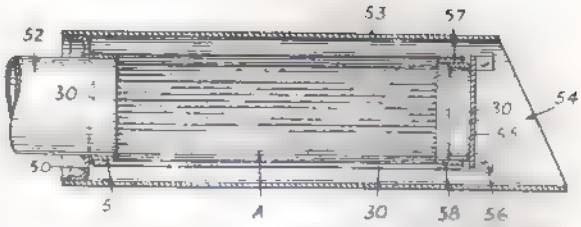
Side view of above.



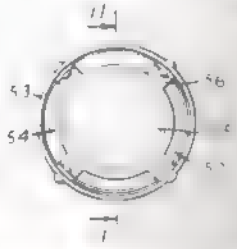
Detail of Caulkins silencer construction.



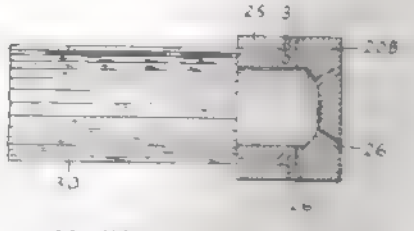
Partial section, modified model.



Cross section, engine modification.



End view, engine modification.



Modified engine model.

CAULKINS SILENCER

(No Nos. 1-9)

10. Inner head.
11. Bore.
12. Longitudinal split.
13. Gun barrel.
14. Securing screws.
15. Forward portion of head.
16. Annular groove.
17. Collars.
18. Optional shroud.

(No No. 19)

20. Outer, movable head.
20a. Head.
20b. Imperforate, movable head.
21. Bore.
22. Inner portion of head.
23. Annular groove.
24. Rounded corners.
25. Collar.
26. Perforations.

(No Nos. 27-29)

30. Parallel resilient members.
30a. Members bent outward under gas pressure.
30b. Parallel members.
30c. Parallel resilient members.

31. Ends bent inward.
(No Nos. 32-39)
40. Shroud.
41. Annular area.
42. Slots.
(No Nos. 43-49)
50. Head.
51. Ring.
52. Exhaust pipe.
53. Outer shroud welded to pipe.
54. Open outer end of shroud.
55. Imperforate circular disk.
56. Radial arms on disk.
57. Cylindrical collar.
58. Sliding ring.

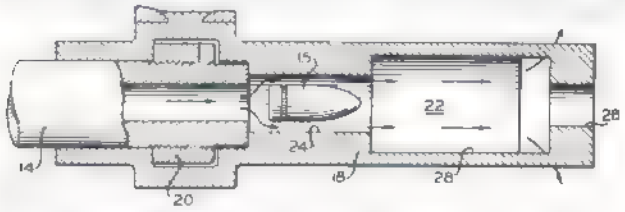
William J. Jarrett

Until Mr. Jarrett began his experimentation, all work with silencers had been aimed at quieting the report of the weapon by slowing down, spinning or breaking up the escaping gases which caused the air turbulence we think of as the sound of a shot. Mr. Jarrett approached the problem with the idea of elevating the frequency of the sound beyond the range of human hearing. This type of silencer would be quite simple to manufacture and is rather easily mounted on military type rifles.

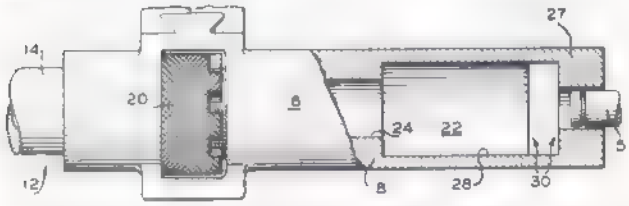
Although the inventor stressed the possible industrial application of a silencer which changes the frequency of sound waves, it should be approached with caution since an "overdose" of high frequency waves can be injurious to the health. We said in the chapter on how silencers work that if there is no one to hear it, there is no sound. While this is true for all practical purposes, that statement could be misleading when dealing with sound waves that exceed 20,000 cycles per second or so. In that case, we can't hear the sound, but it is still there. The human ear just doesn't have the frequency range to pick it up. "Silent" dog whistles are a good example. We can't hear them, but dogs can, therefore they obviously make a sound.

In the form of the altered report of a firearm, the high frequency sound waves probably wouldn't be injurious since they would last for only a few milliseconds. But in the case of industrial use, people would be subjected to them for the entire work day, five days a week. This could quickly result in a large absenteeism record due to both physical and mental illnesses which would be hard to diagnose. Yet these "psychosomatic" illnesses would have a very real, if untraceable, cause.

Since we feel that it would be of interest to any serious student of firearm silencer design, we have included the entire text of Jarrett's patent application at the end of this chapter.

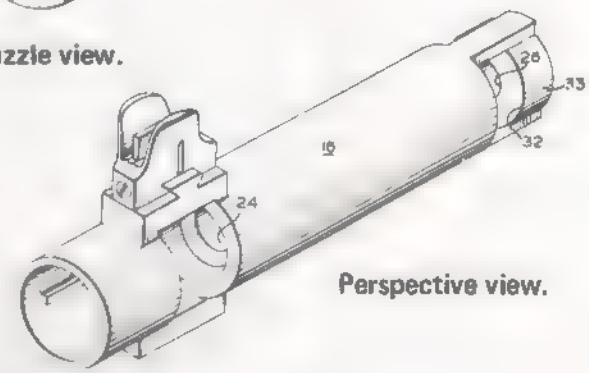


Cross section, Jerrett Noise Reducer built into barrel.



Same view as above, but with projectile leaving muzzle.

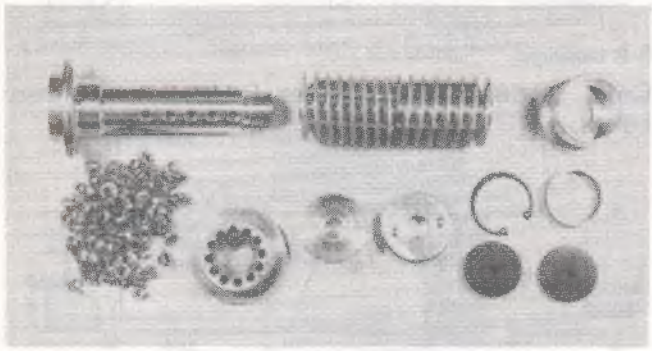
Muzzle view.



Perspective view.

JARRETT NOISE REDUCER
(No Nos. 1-11, 13, 17, 19, 21-23, 25, 29, 31, 32)
12. Gun.
14. Gun barrel.
15. Projectile.
16. Barrel extension.
18. Body of noise reducer.
20. Securing nut.
24. First chamber.
26. Axial aperture.
27. Annular flange.
28. Second chamber.
30. Opposed mouth portions.
33. Curved, annular surfaces.

Tubes for Sionics MAC 10 silencer. The larger tube is to the rear of the assembled unit.



Although overall size (particularly interior volume) and the length to diameter ratio must be considered in silencer design, the interior components are the most important factor in determining how well a silencer works. Shown above are the parts for a Sionics MAC 10 unit.

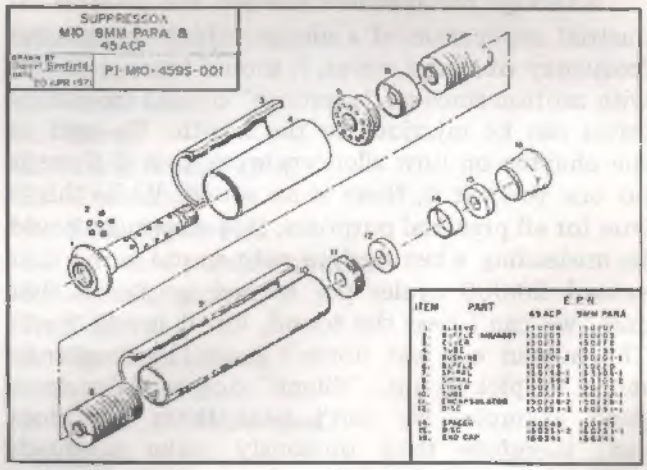
Gen. Mitchell WerBell

The state-of-the-art silencers for the 1970's were the Sionics units designed by Gen. Mitch WerBell, a man whose life story reads more like an unbelievable movie script than reality. Probably the most famous of the Sionics silencers is the one which is mated to the Ingram MAC 10. Although well known in clandestine circles for some time before that, it first received wide public recognition via Hollywood in the early 1970's. In *McQ*, John Wayne used a suppressed MAC 10 to wipe out a gang of nasties in what had to be one of filmland's greatest firefights. There was no doubt, of course, that Duke would come out on top, but he certainly gave audiences some exciting moments before the last magazine was emptied into the bad guys.

In real life, the MAC 10 isn't particularly well suited to what we think of as the standard SMG role. But it is ideally suited for certain purposes such as close quarters assassinations and firepower for expediting political kidnappings. Obtained through illegal channels, it's also a favorite weapon of the Cocaine Cowboys who have recently invaded Florida.

The Sionics units were originally manufactured by Military Armament Corporation (MAC), then by RPB Industries. At this writing, they are manufactured by SWD, Inc., of Atlanta. In addition to the MAC 10, they are also available for the Charter Arms AR-7 and Explorer II, as well as various other weapons. The unit shown in the accompanying photos was assembled from a Sionics kit by a licensed Class II manufacturer.

Finished Sionics silencer on a semi-auto MAC 10, complete with handguard.



Exploded view of MAC 10 silencer as designed by Gen. Mitchell WerBell. The MAC 10/Sionics combination is extremely popular among clandestine operatives.

United States Patent Office 2,868,078
Patented Jan. 13, 1959

2,868,078

NOISE REDUCER FOR GUN

William J. Jarrett, Springfield, Mass., assignor to the United States of America as represented by the Secretary of the Army

Application January 11, 1956, Serial No. 558,593

1 Claim. (Cl. 89—14)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

My invention relates to guns and more particularly to a device therefor for reducing the audible noise of discharge of the guns.

The velocity of sound from the discharge of a cartridge is represented by the equation:

$$V=(gKRT)^{1/2}$$

where V=the velocity of sonic propagation in propellant gas in feet per second, g=the gravitational constant 32.2 foot pounds per second per second, R=the universal gas constant (119), and T=the temperature in degree centigrade.

If the process is assumed to be adiabatic with K=1.246, the value of V is expressed by

$$V=(32.2\times1.246\times119\times1547)^{1/2}$$
$$V=2700 \text{ F. P. S.}$$

The barrel of a gun is a tube or pipe with a closed end having the source of vibration disposed at the open end since the vibrations are set up as the gases leave the barrel. The equation of the fundamental frequency of resonance of the tube is f, in cycles per second.

$$f=\frac{4\cdot l}{(2n+1)}$$

$$f=\frac{(2n+1)\cdot V}{4\cdot l}$$

The barrels of usual firearms vary from two inches for a pistol to 36 inches for a rifle, therefore,

$$f=\frac{3\times2700}{4\times\frac{2}{12}}$$

$$=12{,}080 \text{ C. P. S. for 2'' barrel}$$

$$f=\frac{3\times2700}{4\times\frac{36}{12}}$$

$$=675 \text{ C. P. S. for 36'' barrel}$$

The fundamental frequency, therefore, varies roughly between frequencies of 675 and 12,080 cycles per second which are within the sonic range.

Since the whole amount of discharged gas escapes from the gun to the atmosphere, the volume of sound thus created often causes distress to people confined in a closed space with a gun being fired, and in the open, permits the discharge of the gun to be heard at great distances to disclose the location of the gun.

Silencers for guns have been developed but the silencers now existing are heavy, cumbersome attachments for the barrels with chambers and labyrinths or the like for reducing the pressure of the discharged gases from the guns, and ports to increase the area of discharge of the gases from the barrels.

It is an object of my invention to produce a light compact device to reduce the audible noise of discharge of a machine operated by a gas having a high acoustic velocity.

Another object of my invention is to provide a noise reducer to limit the audible noise of discharge of a gun.

A further object of my invention is to provide a noise reducer to limit the sonic vibrations in the gas emitted from a gun.

A still further object of my invention is to provide a gun with a device including a discharge gas chamber and ports therein for escape of gases from the gun at supersonic frequencies of vibration.

Yet a further object of my invention is to provide a gun with a barrel extension including an entry chamber for leakage of discharge gases around a projectile, an exit chamber having substantially the bore of the gun and an intermediate chamber having a bore greater than the bores of the entry and exit chambers, and gas exhaust ports.

Other aims and objects of my invention will appear from the following explanation thereof.

In carrying out my invention a barrel extension for attachment to a gun includes an aperture with a plurality of chambers including an entry chamber with a bore substantially larger than the diameter of a projectile for leakage of gases therearound, an intermediate chamber having ports with sharp edges for escape of discharge gases therefrom, and an exit chamber with a bore substantially equal to the bore of the gun barrel. The intermediate chamber is provided with a bore greater than the bores of the entry and exit chambers and a length required to resonate supersonic vibrations.

For a more complete understanding of my invention, reference is directed to the following description and the accompanying drawing in which:

Fig. 1 is an elevation, partly in section of a portion of a gun incorporating an embodiment of my invention, with the projectile about to enter the intermediate chamber;

Fig. 2 is a view similar to Fig. 1 with the projectile leaving the gun;

Fig. 3 is a muzzle end view of the barrel extension; and

Fig. 4 is a perspective view of the barrel extension.

Accordingly, a gun 12 having a barrel 14 for discharge of projectiles 15 therethrough is provided with a barrel extension 16 having a body 18 secured to gun 12 by a nut 20.

Body 18 is provided with a first chamber 24 and a second chamber 28 of larger diameter extending forwardly therefrom. The front end of second chamber 28 is terminated by an annular flange 27 through which there is provided an axial aperture 26.

Front chamber 24 is disposed immediately forward of the muzzle end of barrel 14 and has a diameter slightly larger than that of the projectiles 15 so that some of the gases propelling the projectiles forwardly may escape thereby into second chamber 28 before the entry of the projectiles thereinto. Second chamber 28 has a predetermined length and extending laterally from the front end thereof is a pair of diametrically opposed mouth portions 30. The outside of body 18, immediately forward of the mouth portions 30, is cut away to form arcuate surfaces 33 concentric to body 18 with such surfaces having a radius slightly smaller than that of second chamber 28. The junctions of the annular surfaces 33 with the inside face of flange 27 form a right angular edge 32 which lies in the path of the gases expelled forwardly from second chamber 28 to cause the discharge gases to vibrate in the same manner as the passage thereof through a whistle. The frequencies of the vibrations are determined by the length of second chamber 28 and, therefore, the length of such chamber is predetermined as .8

inch. Whereby, as hereinafter explained, the frequency at which the discharge gases vibrate is above the limit of human audibility. Aperture 26 has a diameter approximately the same as that of projectiles 15 so that when such projectiles are passing therethrough the discharge gases are directed entirely out through the mouth 30.

The value of f, the frequency of vibration in the gas discharged from a closed pipe is expressed by

$$f=\frac{V}{4l}$$

where f=cycles per second, V=the velocity of sonic propagation in air in feet per second, and l=the length of the pipe in feet.

The frequency of sound in the gases escaping from ports 30 in cycles per second with a chamber length of .8 inch, therefore, is

$$f=\frac{nV}{2l}$$

$$=\frac{2700}{2\times\frac{0.8}{12}}$$

$$=20{,}000+\text{C. P. S.}$$

This frequency is supersonic since the upper limit of human audibility is conceded to be 20,000 cycles per second.

A portion of the gas traversing the exit chamber behind the projectile of course, still vibrates in the sonic range but, in a model tested in an inclosed range the noise of the gun was considerably reduced.

The gases are attenuated by leakage around the projectiles in entry chamber 24 to reduce the diameter of intermediate chamber 28 required for escape of the gases and to reduce the intensity of noise in the gases traversing chamber 26. The diameter and length of entry chamber 24 determines the degree of the attenuation.

Although a particular embodiment of the invention has been described in detail herein, it is evident that many variations may be devised within the spirit and scope thereof and the following claim is intended to include such variations.

I claim:

An attachment for the muzzle end of a firearm barrel to reduce the noise produced by the discharge of gases therefrom, said attachment including the combination of a body provided with a chamber having a diameter larger than that of the bore of the barrel, an annular flange provided with a rear face and disposed at the front end of said chamber, said flange having an aperture therethrough in axial alignment with the barrel, a pair of mouth portions extending radially outward from said chamber rearwardly of said flange for the discharge of the gases, cutout portions extending forwardly in said body from said mouth portions, arcuate surfaces formed on said flange by said cutout portions, arcuate edges formed at the junctions of said arcuate surfaces with said rear face, said arcuate surfaces having a radius smaller than that of said chamber to locate said edges in the forward path of the gases to set up vibrations therein when discharged through said mouth portions, and said chamber having a predetermined length for producing the vibrations at a frequency higher than that of audible sound.

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